ST. MARY'S COLLEGE (AUTONOMOUS)

Re-Accredited with 'A+' Grade by NAAC

Thoothukudi – 628 001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)

B.Sc. COMPUTER SCIENCE

School of Computing Sciences

Outcome Based Curriculum

(W.e.f 2024)

B.Sc. Computer Science

Course Structure (w.e.f. 2024)

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/ Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	24ULTA11 / 24ULFB11		6	3	40	60	100
II	General English	24UGEN11		6	3	40	60	100
III	Core I	24UCSC11	Programming with C and C++	5	5	40	60	100
	Core Practical I	24UCSCR1	C and C++ Programming Lab	3	3	40	60	100
	Generic Elective I	24UCSE11	Discrete Mathematics	4	3	40	60	100
	Generic Elective Practical I	24UCSER1	Discrete Mathematics Lab	2	1	40	60	100
IV	Skill Enhancement Course I	24UCSSE1	Office Automation Lab	2	2	20	30	50
	Ability Enhancement Course I	24UAVE11	Value Education	2	2	20	30	50
Total				**30**	**22**			

Semester II

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
I	Tamil / French	24ULTA21 / 24ULFB21		6	3	40	60	100
II	General English	24UGEN21		6	3	40	60	100
III	Core II	24UCSC24	Java Programming	5	5	40	60	100
	Core Practical II	24UCSCR2	Java Programming Lab	3	3	40	60	100
	Generic Elective II	24UCSE24	Digital Logic Fundamentals	4	3	40	60	100
	Generic Elective Practical II	24UCSER2	Multimedia Lab 1	2	1	40	60	100
IV	Skill Enhancement Course II	24UCSSE2	Advanced Excel Lab	2	2	20	30	50
	Ability Enhancement Course II	24UAEV24	Environmental Studies	2	2	20	30	50
Total				**30**	**22**			

Semester III

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil / French	24ULTA31/ 24ULFA31		6	3	40	60	100
II	General English	24UGEN31		6	3	40	60	100
III	Core III	24UCSC31	Python Programming	4	4	40	60	100
	Core Practical III	24UCSCR3	Python Programming Lab	3	2	40	60	100
	Generic Elective III	24UCSE31	Data Structures and Algorithms	4	4	40	60	100
	Generic Elective Practical III	24UCSER3	Data Structures and Algorithms Lab	2	1	40	60	100
	NME I	24UCSN31	Computer Literacy	2	2	20	30	50
IV	Skill Enhancement Course III	24UCSSE3	Web Designing Lab	2	2	20	30	50
	Ability Enhancemer Course III	24UAYM31	Yoga and Meditation	1	1	20	30	50
	Self Study/ MOOC Internship (Compulsory)	24UCSSS1	Cyber Security		+2		50	50
				30	**22+2**			

Semester IV

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil / French	24ULTA41 / 24ULFA41		6	3	4	60	100
II	General English	24UGEN41		6	3	4	60	100
III	Core IV	24UCSC41	PHP and MySQL	4	4	4	60	100
	Core Practical IV	24UCSCR4	PHP and MySQL Lab	3	2	4	60	100
	Generic Elective IV	24UCSE41	RDBMS	4	4	4	60	100
	Generic Elective Practical IV	24UCSER4	RDBMS Lab	2	1	4	60	100
	NME II	24UCSN41	Internet Literacy	2	2	2	30	50
IV	Skill Enhancement Course IV	24UCSSE4	Design thinking with Flutter (Lab)	2	2	2	30	50
	Ability Enhancement Course IV (Entrepreneurial Based)	24UACS41	Graphic Design	1	1	2	30	50
V	NCC / NSS / Sports				1			
	CDP(Extension Activity)				+1			
Total				**30**	**23+1**			

Semester V

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core V	24UCSC51	.NET Programming	5	4	40	60	100
	Core VI	24UCSC52	Operating Systems	5	4	40	60	100
	Core VII	24UCSC53	Data Mining and Warehousing	5	4	40	60	100
	Core VIII	24UCSC54	Software Engineering and Testing	5	4	40	60	100
	Core Practical V	24UCSCR5	. NET Programming Lab	4	3	40	60	100
	Discipline Specific Elective I	24UCSE51/ 24UCSE52	IoT and its Applications/ Smart Devices Programming	4	4	40	60	100
IV	Skill Enhancement Course V	24UCSSE5	Recent Trends in Computing	2	2	20	30	50
	Self-Study / Online Course / Internship (Optional)	24UCSSS2	Mathematical Reasoning		+2		50	50
Total				**30**	**25+2**			

Semester VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks		
						CIA	ESE	Total
III	Core IX	24UCSC61	Data Analytics using R	6	5	40	60	100
	Core X	24UCSC62	Computer Networks	5	5	40	60	100
	Core XI	24UCSC63	Big Data Analytics	5	5	40	60	100
	Core Practical VI	24UCSCR6	R Programming Lab	4	3	40	60	100
	Core XII (Project)	24UCSP61	Project and Viva voce	6	4	40	60	100
	Discipline Specific Elective II	24UCSE61/ 24UCSE62	Cloud Computing / Cyber Forensic	4	4	40	60	100
Total				**30**	**26**			

SEMESTER I			
Core 1	**Programming with C and C++**		
Course Code: 24UCSC11	**Hrs/week: 5**	**Hrs / Semester: 75**	**Credits: 5**

Objectives:

- To learn fundamental concepts of C and C++
- To understand the Programming techniques using C and C++
- To acquire knowledge of object-oriented programming

CO.No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	describe the structured and object-oriented paradigm concepts of programming	K1
CO-2	understand the fundamentals of programming with C and C++	K2
CO-3	demonstrate the programming techniques with various types of statements in C and use of various OOP concepts	K3
CO-4	examine the algorithms and programs to find solutions using C and C++	K4
CO-5	explain and develop programs to solve problems through looping, array concepts, object-oriented concepts of function overloading, operator overloading, and inheritance.	K5

SEMESTER I			
Core 1	**Programming with C and C++**		
Course Code: 24UCSC11	**Hrs/week: 5**	**Hrs / Semester: 75**	**Credits: 5**

Unit I:

Constants, variables, and Data Types: History of C - Character Set. - CTokens -Keywords and Identifiers - Constants -Variables -Data Types -Declaration of Variables -Declaration of Storage Class. Assigning Values to Variables - Defining Symbolic Constants -Declaring a Variable as Constant

Operators and Expressions: Introduction - Arithmetic Operators - Relational Operators - Logical Operators -Assignment Operators -Increment and Decrement Operators -Conditional Operator - Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Type Conversions in Expressions -Operator Precedence and Associativity -Mathematical Functions

Unit II:

Managing Input and Output Operations: Reading a Character -Writing a Character - Formatted Input - Formatted Output - Decision Making and Branching

Decision Making and Branching: Introduction -Decision Making with IF Statement -Simple IF Statement - The …IF ELSE Statement - Nesting of IF... ELSE Statements - The ELSE IF Ladder -The Switch Statement -The ?: Operator The GOTO Statement

Decision Making and Looping: Introduction -The WHILE Statement -The DO Statement. -The FOR Statement - Jumps in LOOPS - Concise Test Expressions .

Unit III:

Arrays: -One-dimensional Arrays -Declaration of One-dimensional Arrays - Initialization of One-dimensional Arrays - Two-dimensional Arrays - Initializing-Two-dimensional Arrays - Multi-dimensional Arrays - Dynamic Arrays - More about Arrays.

Character Arrays and Strings:- Declaring and Initializing String Variables
-Reading Strings from Terminal - Writing Strings to Screen -Arithmetic Operations on Characters - Putting Strings Together -Comparison of Two Strings - String-handling Functions
-Table of Strings - Other Features of Strings .

Unit IV:

User-defined Functions:- Introduction -Need for User defined Functions -A Multi-function Program -Elements of User-defined Functions -Definition of Functions -Return Values and their Types -Function Calls -Function Declaration - Category of Functions -No Arguments and no Return Values -Arguments but no Return Values-Argumenta with Return Values -No Arguments but Returns a Value -Functions that Return Multiple Values - Nesting of Functions -Passing Arrays to Functions -The Scope, Visibility and Lifetime of Variables-Multifile Program .

Pointers:- Understanding Pointers Accessing the Address of a Variable -Declaring Pointer Variables - Initialization of Pointer Variables -Accessing a Variable through its Pointer - - Pointers and Arrays .

Unit V:

Principles of Object-Oriented Programming:- Object-Oriented Programming Paradigm-Basic Concepts of Object-Oriented Programming -Benefits of OOP -Applications of OOP.

Classes and Objects:- C structures- Specfying a Class -Defining Member Functions-

- Making an Outside function Inline - -Private Member Function-Static Data Member – Static Member Functions -Friendly Function.

Constructors and Destructors:-

Constructors - Parameterized Constructora - Multiple Constructors in a Class - Constructors with Default Argumenta - Copy Constructor.

Text Books:

1. E. Balagurusamy, " *Programming in ANSI C"* .India: McGraw Hill Education Private Limited, Eighth Edition 2019.
2. E. Balagurusamy, "*Object-Oriented Programming with C++*", TMH 2013, 7th Edition.

Books for Reference:

1.Byron Gottfried, "*Programming with C*". India: McGraw Hill Education Private Limited. 3rd Edition 2017.
2. Ashok N Kamthane, "*Object-Oriented Programming with ANSI and Turbo C++*", Pearson Education 2003.
3. Bjarne Stroustrup, "*The C++ Programming Language*", Fourth Edition, Pearson Education
4. Hilbert Schildt, (2009), "*C++ - The Complete Reference*", 4th Edition, Tata McGraw-Hill

Web Resources:

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

2. https://www.programiz.com/cpp-programming

PSO Relation Matrix (Course Code: 24UCSC11)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER- I			
Core Practical 1	**C and C++ Programming Lab**		
Course Code: 24UCSCR1	**Hrs/week: 3**	**Hrs / Semester: 45**	**Credits: 3**

Objectives:

- To write programs using branching statements and array concepts in C.
- To write programs with classes and functions in C++.
- To develop programs in C++ using object-oriented concepts.

CO. No.	Upon completion of this course, students will be able to	CL
CO-1	describe the algorithms and write simple programs in C with various operators	K1
CO-2	understand the fundamental concepts of branching and develop programs to solve problems using C and C++ programming languages	K2
CO-3	apply the concepts of arrays and functions to develop programs in C and C++ programming languages	K3
CO-4	examine and develop the programs using classes and objects	K4
CO-5	examine and develop programs using object-oriented concepts of function overloading, operator overloading, and inheritance.	K4

SEMESTER- I			
Core Practical 1	**C and C++ Programming Lab**		
Course Code: 24UCSCR1	**Hrs/week: 3**	**Hrs / Semester: 45**	**Credits: 3**

Practical List:

1. Solve Quadratic equation-control statements.
2. The sum of Digits and reverse the number.
3. Prime number Checking.
4. Sine Series evaluation.
5. Sorting an Array of numbers
6. Linear Searching using function
7. Vowels counting
8. Palindrome checking
9. Matrix multiplication using Pointers
10. Area calculation using Function overloading (Minimum three functions).
11. Implement constructor overloading
12. Implement a friend function.

PSO Relation Matrix (Course Code: 24UCSCR1)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER I			
Generic Elective I	**Discrete Mathematics**		
Course Code: 24UCSE11	**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 I			
Generic Elective I	**Discrete Mathematics**		
Course Code: 24UCSE11	**Hrs/week: 4**	**Hrs /Semester:60**	**Credits: 3**

Unit I:

Set Theory – Introduction – 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, partitions – mathematical induction.

Relations – Introduction – 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 – Introduction – 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 – labeled and weighted graphs – complete, regular, and bipartite graphs – tree graphs.

Directed Graphs: 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: 24UCSE11)

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	2	2	3	3	3	3	3
CO-2	3	3	3	2	2	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	2
Ave.	**3**	**3**	**3**	**2.6**	**2.6**	**3**	**3**	**3**	**3**	**2.8**

SEMESTER I			
Generic Elective Practical I	**Discrete Mathematics Lab**		
Course Code: 24UCSER1	**Hrs/week: 2**	**Hrs /Semester:30**	**Credits: 1**

Objectives:

- To write programs to understand the concepts of discrete mathematics.
- To write programs using functions.
- To develop programs to implement counting principles of mathematics.

Course Outcomes:

CO.No.	Upon completing this course, students will be able to	CL
CO-1	define and describe algorithms to solve basic mathematical series problems using C programming.	K1
CO-2	explain and demonstrate the use of control structures and recursion for mathematical and logical problem solving	K2
CO-3	apply recursive functions and array-based logic to solve combinatorial and numerical problems.	K3
CO-4	analyze the use of functions and develop logic to extract and interpret data from user input.	K4
CO-5	examine and construct algorithms for solving advanced combinatorial problems using permutations and combinations.	K4

SEMESTER I			
Generic Elective Practical I	**Discrete Mathematics Lab**		
Course Code: 24UCSER1	**Hrs/week: 2**	**Hrs /Semester:30**	**Credits: 1**

Practical List:

1. Sum of series of squares of N numbers
2. Sum of a series of odd numbers
3. Sum of series of even numbers
4. Polynomial Evaluation using Horner's methods.
5. Greatest Common divisor using Euclidian Algorithm.
6. Evaluate the function using the Ackermann function.
7. Generate Pascal's Triangle.
8. Fibonacci series using recursive function.
9. Binomial co-efficient using recursive function.
10. Find out the frequency of numbers using a function.
11. Computing Permutation P(n,r) and Permutation with repetitions.
12. R- Combination of a string

PSO Relation Matrix (Course Code: 24UCSER1)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER I			
Skill Enhancement Course I (Discipline Specific)	**Office Automation**		
Course Code:24UCSSE1	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits :2**

Objectives:

- To familiarize various Microsoft Office components
- To apply various formatting tools
- To create effective presentations

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	acquire basic knowledge of Word and PowerPoint.	K1
CO-2	understand the formatting of texts in Word and the basics of presentation.	K2
CO-3	construct tables, organise Word documents with images, utilize animations in PowerPoint,	K3
CO-4	examine spell checker and experiment with mail merge	K4
CO-5	utilize audio and video with a PowerPoint	K4

SEMESTER I			
Skill Enhancement Course I (Discipline Specific)	**Office Automation Lab**		
Course Code:24UCSSE1	**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. Create and Design Admission/Enquiry Forms.
7. Use smart art and create organization charts.
8. Create a PowerPoint presentation about your college.
9. Create a PowerPoint presentation about your hobbies.
10. Create a PowerPoint presentation about the sport that you like.
11. Create or edit presentation handouts.
12. Create Organization Chart and add transition effects.

PSO Relation Matrix (Course Code: 24UCSSE1)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER II			
Core II	**Java Programming**		
Course Code: 24UCSC21	**Hrs / week: 5**	**Hrs / Semester: 75**	**Credits: 5**

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, and AWT

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	understand the OOPs concepts and applet related to Java Technology.	K1
CO-2	relate application with applet programming.	K2
CO-3	experiment the concepts to real time applications	K3
CO-4	create GUI based applications	K4
CO-5	create webpages using Applet programming	K5

SEMESTER II			
Core II	**Java Programming**		
Course Code: 24UCSC21	**Hrs / Week :5**	**Hrs / Semester: 75**	**Credits :5**

Unit I:

The History and Evolution of Java - Overview of Java - Data Types, Variables and Arrays - Operators – Control Statements – Introducing Classes - A Closer Look at Methods and Classes- Constructor and method o overloading.

Unit II:

Inheritance: Inheritance basics –using super – method overriding – using final with inheritance

Packages and Interfaces: Packages - Access Protection – Importing Packages- Interfaces.
I/O Basics-Reading Console Input-Writing Console Output-The PrintWriter Class-Reading and Writing Files:

Unit III:

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.
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 IV:

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). Adapter Classes

Unit V:

Introducing the AWT: AWT Classes-Window fundamentals -working with Frame Windows - Working with Graphics – Colour - Font.

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.

Text Books:

1. Herbert Schildt. "*The Complete Reference Java™*" . New Delhi:Tata Mc Graw Hill. 8th Edition 2011.

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: 24UCSC21)

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

SEMESTER II			
Core Practical II	**Java Programming Lab**		
Course Code: 24UCSCR2	**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 webpages using Applet .	K5
CO-5	create interactive forms using AWT controls	K5

SEMESTER II			
Core Practical II	**Java Programming Lab**		
Course Code: 24UCSCR2	**Hrs/week: 3**	**Hrs / Semester: 45**	**Credits: 3**

Practical List:

1. Print the prime numbers for the given range.
2. Write a Java program to count the number of characters, lines and words in a text
3. Implement Overloading Constructor and Overloading Method
4. Apply method Overriding concept.
5. Create packages and import it
.6. Create and implement an interface.
7. Create a thread Using Thread class
8. Display flash message using runnable interface
9. Create an applet with four Checkboxes with labels and a Text area object.
10. 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.
11. Demonstrate the use of choice box.
12. Demonstrate the use of following exceptions.
    i. Arithmetic Exception
    ii. Number Format Exception
    iii. Array Index Out of Bound Exception
    iv. Negative Array Size Exception
13. Illustrate mouse event handling.

PSO Relation Matrix (Course Code: 24UCSCR2)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	2	3	2	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER II			
Generic Elective II	**Digital Logic Fundamentals**		
Course Code: 24UCSE21	**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 II			
General Elective II	**Digital Logic Fundamentals**		
Course Code: 24UCSE21	**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 – Implicants – 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

Text Book:

1. M. Morris Mano, "*Digital Logic and Computer Design"*, Noida: Pearson education India, First Edition, 2016.

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: 24UCSE21)

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	2	2	3	3	3	2	2
CO-2	3	3	3	2	2	3	3	3	2	2
CO-3	3	3	3	2	2	3	3	3	3	2
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**2.8**	**2.6**	**2.6**	**3**	**3**	**3**	**2.6**	**2.6**

SEMESTER II			
Generic Elective Practical II	**Multimedia Lab 1**		
Course Code: 24UCSER2	**Hrs/week: 2**	**Hrs / Semester: 30**	**Credits: 1**

Objectives:

- To understand the various tools used in image editing
- To make use of effects and filters in image editing
- To create logos and advertisements

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	understand the fundamentals of 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 II			
Generic Elective Practical II	**Multimedia Lab 1**		
Course Code: 24UCSER2	**Hrs/week: 2**	**Hrs / Semester: 30**	**Credits: 1**

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.

PSO Relation Matrix (Course Code: 24UCSER2)

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	3	3	3	3	3	2	3
CO-2	3	3	3	3	2	3	3	3	2	3
CO-3	3	3	2	2	3	3	3	3	3	3
CO-4	3	3	3	2	3	3	3	3	3	3
CO-5	3	3	3	3	2	3	3	3	3	2
Ave.	**3**	**3**	**2.8**	**2.6**	**2.6**	**3**	**3**	**3**	**2.6**	**2.8**

SEMESTER II			
Skill Enhancement Course II	**Advanced Excel Lab**		
Course Code: 24UCSSE2	**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 analyse Data Using PivotTables and Pivot Charts

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	aggregate 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

SEMESTER II			
Skill Enhancement Course II **Advanced Excel Lab**			
Course Code: 24UCSSE2	**Hrs/week: 2**	**Hrs /Semester:30**	**Credits: 2**

Practical List:

1. Fing the following: i. VLOOKUP with MATCH 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"

h. Arrange the data in Alphabetical order of the column "Nationality", Name" and "Discipline" and provide serial values in the first column, "Sl. No

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	240	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	1,244
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	1,240
10/31/2019	Jack	East	1,624

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 number of employees who are not giving tax

PSO Relation Matrix (Course Code: 24UCSSE2)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	3	3	3	3	3	3	3	3	3	3

SEMESTER- III			
Core III	**Python Programming**		
Course Code:24UCSC31	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :4**

Objectives

- To understand about Python
- To learn about various objects list, tuples and dictionaries
- To use recursion to solve problems
- To understand files and use them for reading and writing.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	describe the fundamental concepts of the Python programming language	K1
CO-2	discuss various operators data structures, functions, and object-oriented programming (OOP) concepts in Python	K2
CO-3	apply Python data structures like lists, tuples, dictionaries, files, and classes to develop mathematical solutions	K3
CO-4	analyze Python's features, including data structures, files, and classes, in program development to optimize problem-solving approaches	K4
CO-5	evaluate the efficiency and real-world impact of Python-based solutions in program development with various aspects of Python	K5

SEMESTER- III			
Core III	**Python Programming**		
Course Code: 24UCSC31	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :4**

Unit I: Introduction to Python & Basic Syntax

Features of Python-Variables, Data Types, and Type Conversion-Operators (Arithmetic, Comparison, Logical, Bitwise)-Input and Output Functions- Conditional Statements (if, elif, else)- Looping Constructs (for, while, nested loops)

Unit II: Strings & Data Structures

String Manipulation and String Formatting-Lists and List Comprehensions-Tuples, Sets, and Dictionaries

Unit III: Functions & Modules

Functions and Scope-Lambda Functions and Recursion- Introduction to Modules and Packages -Using pip to Install Third-Party Libraries.

Unit IV: File Handling & Error and Exception Handling

Reading and Writing Files (Text, CSV, JSON)-File positions, File Paths and Renaming and deleting files -Exception Handling (try, except, finally, raise).

Unit V: Classes and Objects & GUI

Classes and Objects-Constructors and Self Parameter-Class and Instance Variables-Inheritance and Polymorphism-Method Overriding and Encapsulation-Magic Methods. Creating Basic Forms with Tinker and ttk widget.

Text Book:

1. Reema Thareja *Python Programming Using Problem Solving Approach*. Oxford University Press

2. AlanD.Moore *Python GUI programming with Tkinter* , Packt Publishing Ltd

Books for Reference:

1. Eric Matthes *Python Crash,* No Starch Press, Inc.
2. Sheetal Taneja and Naveen Kumar *Python-Programming-Modular-Approach*
3. Mark Lutz *Learning ,* O'Reilly Media

Websites:

1. https://www.learnpython.org
2. https://www.python.org

PSO Relation Matrix (Course Code: 24UCSC31)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER- III			
Core – Practical III	**Python Programming Lab**		
Course Code: 24UCSCR3	**Hrs / week :3**	**Hrs / Semester: 45**	**Credits :2**

Objectives:

- To learn fundamental concepts and implement loops, conditional statements, functions, and file handling for structured program development.
- To develop Python programs using data structures such as lists, tuples, dictionaries, and sets to solve computational problems.
- To apply object-oriented programming (OOP) concepts in Python for efficient program development.
- To build Python applications that handle exceptions in file operations for error-free execution.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	Recall and demonstrate the basic concepts of Python, including syntax, data types, operators, and I/O functions	K1
CO-2	illustrate and demonstrate the execution of loops, conditional statements, and functions to solve basic problems	K2
CO-3	implement python programs using data structures, functions, file handling, and OOP concepts.	K3
CO-4	analyse the Python programs for improved performance and exception handling.	K4
CO-5	Test and validate Python-based applications based on functionality and efficiency.	K5

SEMESTER- III			
Core – Practical III	**Python Programming Lab**		
Course Code: 24UCSCR3	**Hrs / week :3**	**Hrs / Semester: 45**	**Credits :2**

Practical List:

1. Write Python Programs using conditional statements.
2. Solve problems using loops in Python Programs
3. Write Python programs using List object.
4. Create Python programs using Tuples.
5. Write Python programs using dictionary.
6. Develop Python programs using user defined functions.
7. Write Python programs to solve problems using recursion.
8. Write Python Programs to manipulate strings.
9. Develop Python Programs for pattern matching.
10. Write Python programs using files for input and output.
11. Write Python programs for exception handling.
12. Implement python program using class and methods.
13. Create a simple GUI in python using tinker

PSO Relation Matrix (Course Code: 24UCSCR3)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER- III			
Generic Elective III	**Data Structures and Algorithms**		
Course Code: 24UCSE31	**Hrs / week : 4**	**Hrs / Semester: 60**	**Credits : 4**

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- III			
Elective III	**Data Structures and Algorithms**		
Course Code: 24UCSE31	**Hrs / week : 4**	**Hrs / Semester: 60**	**Credits : 4**

Unit I:

Introduction: 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- Circular linked list – Multilinked list

Unit III:

Stacks and Queues: Basic Stack operations – Stack Linked List Implementation – Stack Applications – Queue operations – Queue Linked List Design

Unit IV:

Trees and Heaps: Basic Tree Concepts – Binary Trees – Binary Tree Traversals – Application of Binary tree – General Trees – Binary search Trees – Insertion, Deletion Heap - Heap Data Structures – Heap Algorithms -

Unit V: Sorting and Graphs: - General sort concepts – 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.Gilberg&Behrouz A. Forouzan. *.Data Structures A Pseudo code Approach with C++*. Thomson Brooks /Cole. 4thReprint, 4thedition 2006.

Chapters 1,2.1,2.3,2.4,3.1- 3.,3.6, 4.1-4.3 ,5.1 ,5.2,7.1 -7.5 ,8.1,9.1 -9.5,11.1,11.4(Quick sort only),11.5 , 12.1 -12.5

Books for Reference:

1. Ellis Horowitz &SartajSahni.*Fundamentals of Data Structures*. GalGotia publications. 2006.
2. Adam Drozdek.*Data Structures & Algorithm in Java* .Ingram .third edition2008.
3. Alfred V.Aho,JohnE.Hopcroft,Jeffrey D Ullman .*Data Structures & Algorithms*. New Delhi: Pearson Education India. 1st edition2002.
4. SeymourLipschutz. *Data Structures. New* Delhi: McGraw Hill .Schaum's Outline Series .Revised First Edition 2014.

PSO Relation Matrix (Course Code: 24UCSE31)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	2	3
CO-3	3	3	3	2	2	3	3	3	3	3
CO-4	3	3	2	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**	**2.8**	**3**

SEMESTER- III			
Elective- III	**Data Structures and Algorithms Lab**		
Course Code: 24UCSER3	**Hrs / week : 2**	**Hrs / Semester: 30**	**Credits : 1**

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	Recall and demonstrate the basic concepts of C++	K1
CO-2	illustrate and demonstrate the data structures stack, queue and linked list using C++ Programming language	K2
CO-3	apply C++ programming to various data structures.	K3
CO-4	analyse the execution efficiency of various applications of different data structures.	K4
CO-5	test and validate applications based on functionality.	K5

SEMESTER- III			
Elective- III	**Data Structures and Algorithms Lab**		
Course Code: 24UCSER3	**Hrs / week : 2**	**Hrs / Semester: 30**	**Credits : 1**

1. Sequential Searching
2. Binary Searching
3. Implement linked list and perform the following operations

   i. Add a node as first node ii. Add a node as last node iii. Add a node as middle node

4. Implement Linked list and perform the following operations.
   i. Delete the first node ii. Delete the last node iii Delete the middle node
5. Implement a stack using Linked List and perform the push and pop operations.
6. Implement a queue using Circular list and perform enqueue and dequeue operations.
7. Implement binary tree using Linked and perform the following traversal.

   i. Inorder Traversal ii. Preorder Traversal iii. Post order Traversal

8. Merge sort.
9. Quick sort.
10. Graph traversal.

PSO Relation Matrix (Course Code: 24UCSER3)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER III			
Skill Enhancement Course III	**Web Designing Lab**		
Course Code:24UCSSE3	**Hrs. / week:2**	**Hrs. / Semester: 30**	**Credits:2**

Objectives:

- To learn how to design and develop a Web page using HTML,DHTML, CSS, Javascript and React JS
- 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

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	Recall and demonstrate the basic concepts web designing	K1
CO-2	illustrate and demonstrate the creation of web pages with scripting languages	K2
CO-3	build web pages with HTML, DHTML and Java Script languages	K3
CO-4	analyse the dynamic web pages created with various scripting languages	K4
CO-5	test different websites created with scripting languages	K5

SEMESTER III			
Skill Enhancement Course III	**Web Designing Lab**		
Course Code:24UCSSE3	**Hrs. / week:2**	**Hrs. / Semester: 30**	**Credits:2**

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.
11. Write a program to create a arithmetic calculator using React JS.
12. Create a login form using React JS

PSO Relation Matrix (Course Code: 24UCSSE3)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER III			
NME I	**Computer Literacy**		
Course Code:24UCSN31	**Hrs/week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Objectives:

- To learn various types of Computers.
- To understand different parts of computer and its usage
- To learn about different attacks and security on using computers

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	describe the basics of Microsoft word and spreadsheet	K1
CO-2	discuss different types viruses and computer security	K2
CO-3	identify the use of various types of recent technologies used in computer field	K3
CO-4	compare the various types E-governance services	K4
CO-5	explain the different types of E-learning sources	K5

SEMESTER III			
NME I	**Computer Literacy**		
Course Code:24UCSN31	**Hrs/week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Unit I:

Microsoft Word: Introduction
Creating Documents: Toolbars-Typing Text-Correcting Mistakes-AutoText Entries-Inserting and Deleting Text-Inserting Graphics-Undoing and Redoing-Inserting Date and Time -Saving Documents-Opening a Documents-Printing a Document

Create a Story using Word Document and insert pictures and use various Text alignments

Introduction to Electronic Spreadsheet: Introduction
Characteristics of a Spreadsheet: Table Format-Data Forms-Recalculations-Storage and Retrieval-Presentation-Standard Formats-Spreadsheet Packages

Create a Student Marklist using Spreadsheet

Unit II:

Introduction to Computer Security: Introduction-Types of Computer Crimes-Computer Security-Crime Security-Computer Crime by Authorized Users-Computer Crime through Unauthorized Access-Potentially Malicious Computer Programs.

Computer Viruses, Bombs and Worms: Introduction-Types of Viruses-More Viruses-Characteristics of Viruses-Categories of Viruses-Anti-Virus Software or Virus Vaccines

Unit III:

Recent Trends in Computer Science

Artificial Intelligence-Augmented Reality-Cloud Computing-Deep Learning-Internet of things-Robotics-Machine Learning Techniques-Natural Language Processing-Virtual Reality

Unit IV:

Electronic Governance

Introduction - E-Governance Initiatives in India- E-Governance through- Digital India- Integrated Nutrient Management- E-Governance through Common Service Centre- CSC 2.0 Scheme-National e-Governance Plan- Agencies Enabling Digital India- Digital India Services- Electronic Payment and Receipt (EPR)-The Government policy statement on EPR states as follows- Overview of Payments and Receipts in Government Departments - Digital Locker- Benefits of Digital Locker - e-District Services- Digital AIIMS-India BPO Promotion Scheme (IBPS)- Geographical Information System (GIS) - Mobile Sewa App Store (m-Appstore) GARV Grameen Vidyutikaran

Unit V:

E – Learning

MOOC –Coursera- edX - MOOC at India- Digital Library- National Digital Library-E-Journals and Books-Introduction to IT Act- Publishing of information which is obscene in electronic form- Penalty for misrepresentation- Publication for fraudulent purpose - Social Networks- Social Network Analysis- Government Initiatives on Social Media-Sentiment Analysis- Predictive Policing

Text Book:

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

2. *Dr. N. Krishnan, Dean*, Faculty of Science *Dr. V. Balamurugan*, Professor/ CSE Dr. *P. Arockia Jansi Rani*, Associate Professor / CSE, Manonmaniam Sundaranar University, Computer For Digital Era

Books for Reference:

1. Peter Norton's. "*Introduction to computers"*. India: New Delhi: Tata McGraw-Hill. Edition 2004

PSO Relation Matrix (Course Code: 24UCSN31)

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	2	3	3	3	3	2	3	3	3
CO-2	3	2	2	3	3	3	3	3	3	3
CO-3	3	3	2	2	2	3	2	2	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.6**	**2.6**	**2.8**	**2.8**	**3**	**2.6**	**2.8**	**3**	**3**

SEMESTER III			
Ability Enhancement Course I Yoga and Meditation			
Course Code: 24UAYM31	**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 1 **Cyber Security**	
Course Code:24UCSSS1 (Compulsory)	**Credits : 2**

Objectives:

- To understand the basic concepts of Cyber Ethics, Virtues and Values
- To design and develop a security architecture for society.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	define key terms and concepts related to cyber security	K1
CO-2	explain the need for cyber regulation and ethical regulation in practice	K2
CO-3	implement ethics in digital world	K3
CO-4	analyze cyber crimes	K4
CO-5	determine signs of cyber bullying	K5

SEMESTER- III	
Self Study 1 **Cyber Security**	
CourseCode:24UCSSS1 (Compulsory)	**Credits: 2**

Unit-I:

Cyber Ethics: Ethics in Cyber Society: Core Values and Virtues: Definitions, Specificities of Cyberspace, Dimensions of Cyber Ethics in Cyber Society, Core Values and Virtues, Cyber Ethics by norms, Laws and Relations.

Unit-II:

Artificial Intelligence Ethics: "AI for Good". Cyber Ethics as Business Ethics. Cyber Law and Cyber Ethics: Importance of Cyber Law, The Significance of Cyber Ethics, and Cyber Crime is Unethical and Illegal, The need for Cyber Regulation.

Unit-III:

Ethics in the Information Society, Technologies Need Standards, Rules and Regulations, Technology Ethics, Legal Ethics, the Nine P's of Ethics in Information Society.

Unit-IV:

Cyber Crime: Cybercrime offences, Computer Related Offences, Content Related offences, Government Efforts in Cyber security, Cyber security in the Academic world. Critical Thinking of Citizens: Ethics in Digital Age, Acting Responsibly in the Digital World, Three Dilemmas: Ethical Intelligence in Practice.

Unit-V:

Cyber Bullying: Introduction – Cyber Bullying, Peoples in Cyber Bullying, Signs of Cyber Bullying, Suicidal Tendencies, Role of Children and Duty of parents, Limiting Access of Technology, Child Bullying. Child Protection Online: Prevention through Education for Digital Literacy and Safety.

Text Book:

1. Christoph Stuckelberger, Pavan Duggal. *Cyber Ethics 4.0, Serving Humanity with Values*. Globethics.net Global series no 17, 2018.

Books for Reference:

1. Diane Bailey.*Cyber Citizenship and Cyber Safety: Cyber Ethics*.USA:The Rosen Publishing group 2008.
2. Kizza, Joseph Migga, Ethical and Social Issues in the Information Age, 5th edition, Springer, 2015.
3. Bynum, Terrel Ward &Rogerson, Simon, eds: *Computer Ethics & Professional Responsibility: Introductory Text & Readings*. Blackwell 2004

PSO Relation Matrix (Course Code: 24UCSSS1)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER IV	
Core IV	**PHP and MySQL**

Course Code: 24UCSC41	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:24UCSC41	**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, Objects and Custom Functions: Using Arrays to Group related values-Creating an object- Declaring a class-Introspection- 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 Character Data- Formatting Numeric Data-Formatting Dates and Times-Paginating Large Result Set-sample database applications

Text Book:

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. Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf "Programming PHP"-O'Reilly
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: 24UCSC41)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER IV			
Core Practical IV	**PHP and MySQL Lab**		
Course Code: 24UCSCR4	**Hrs/week :3**	**Hrs. / Semester: 45**	**Credits :2**

Objectives:

- To understand programming fundamentals in PHP
- To acquire knowledge on databases and tables in MySQL
- To practice session and cookie handling 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: 24UCSCR4	**Hrs/week :3**	**Hrs. / Semester: 45**	**Credits :2**

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. PHP script to set, retrieve and delete cookies
7. PHP script using session variables.
8. Validating Input
9. Creating a simple table with constraints.
10. Insertion, Updation and Deletion of rows in MYSQL tables.
11. Querying using ANY, ALL,IN, EXISTS,NOT EXISTS,UNION,INSERSECT
12. Querying using Aggregate Functions(COUNT,SUM,AVG,MAX and MIN)
13. Formatting using Query.

PSO Relation Matrix (Course Code: 24UCSCR4)

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	3	3	3	3	3	3	3
CO-2	3	2	3	3	3	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**3**	**2.8**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER IV			
Generic Elective IV	**RDBMS**		
Course Code:24UCSE41	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :4**

Objectives:

- To efficiently organize data and effectively retrieve data
- To apply E-R diagrams and normalization procedures to avoid redundancy in storing data
- To study PL/SQL and relational database design using Oracle.

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 PL/SQL Programming	K4
CO-5	apply database concept to real life problem	K5

SEMESTER IV			
Generic Elective IV	**RDBMS**		
Course Code:24UCSE41	**Hrs / week:4**	**Hrs. / Semester: 60**	**Credits 4**

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

Unit IV:

Introduction to PL/SQL Programming, Control Structures and Embedded SQL, Views, Index

Unit V:

Cursor, Exceptions, Procedure, Functions, Packages, Triggers

Text Books:

1. Abraham Silberschatz Henry F.KorthS.Sudharshan."*Database System Concepts"*.NewYork:Tata McGraw Hill.Sixth Edition 2013.
2. Nilesh Shah," Database Systems Using Oracle" A Simplified Guide to SQL and PL/SQL.

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: 24UCSE41)

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	2	3	3	2	3	3	3
CO-2	3	2	3	3	3	3	2	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**3**	**2.8**	**3**	**3**	**2.8**	**3**	**3**	**3**

SEMESTER IV			
Generic Elective Practical IV RDBMS Lab			
Course Code:24UCSER4	**Hrs / week:2**	**Hrs. / Semester: 30**	**Credits :1**

Objectives:

- To learn the basics of MySQL, including how databases store and organize data.
- To write and use SQL queries to implement packages, triggers and exception handling.
- To improve database performance by using functions and cursor.

Course Outcomes:

CO.No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	recall and demonstrate the database concepts	K1
CO-2	compare Join queries result set	K2
CO-3	construct and execute SQL queries to perform CRUD (Create, Read, Update, Delete) operations on a MySQL database.	K3
CO-4	design and modify database schemas using built in Functions	K4
CO-5	integrate MySQL with web applications to dynamically retrieve, update, and display data based on user interactions.	K5

SEMESTER IV			
Generic Elective Practical IV **RDBMS Lab**			
Course Code:24UCSER4	**Hrs / week:2**	**Hrs. / Semester: 30**	**Credits :1**

1 .Searching for data by different criteria with sub queries
2. Sorting of data.
3. Demonstration of joining tables.
4. Database Index Creation, Renaming an Index, Copying another Index, Dropping an Index
5. Create Views, Partition and Locks
6. PL/SQL Procedure for Application Using Exception
7. PL/SQL Procedure for Application Using Cursors
8. PL/SQL Procedure for Application Using Triggers
9. PL/SQL Procedure for Application Using Package
10. Programs to Prepare Report Using Functions

PSO Relation Matrix (Course Code: 24UCSER4)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER IV			
NME II	**Internet Literacy**		
Course Code:24UCSN41	**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	describe the History of the Internet	K1
CO-2	discuss different types of browsers	K2
CO-3	experiment the usage of blog by creating blog id and social media profile	K3
CO-4	outline Electronic Publishing and applications	K4
CO-5	explain making money using internet	K5

SEMESTER IV			
NME II	**Internet Literacy**		
Course Code:24UCSN41	**Hrs/week:2**	**Hrs/Semester:30**	**Credits: 2**

Unit I:

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

Self-Study: Learn AI Tools

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 115-124,135-144)Chapter-11, 13

Self-Study: Create Webpage using HTML

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

Self-Study: Create Blog and Design Invitation using Open Source Applications

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-HillInc,US , 2nd Edition

2. Vikas Gupta, "*Internet and Web design"*, India: Rematch Press I. Edition 2003.

Web Resources:

1. https://assets.hostinger.com/content/tutorials/pdf/74-Ways-Make-Money-Online.pdf

PSO Relation Matrix (Course Code: 24UCSN41)

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	3	3	3	3	2	3	3
CO-2	3	3	3	2	3	3	2	3	3	3
CO-3	3	3	2	2	3	3	3	3	2	3
CO-4	3	2	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**2.8**	**2.6**	**3**	**3**	**2.8**	**2.8**	**2.8**	**3**

SEMESTER IV			
Skill Enhancement Course IV (Discipline Specific)	**Design Thinking with Flutter (Lab)**		
Course Code:24UCSSE4	**Hrs / week :2**	**Hrs / Semester: 30**	**Credits: 2**

Objectives:

- To learn the fundamentals to develop cross-platform mobile apps.
- To make the students learn to code quality and reusability.
- To create interactive apps that runs on web pages or on the desktop.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	recall and describe the core concepts of Flutter, including widget lifecycle, Dart syntax, and project structure across all units.	K1
CO-2	Explain the use of common Flutter widgets, navigation patterns, and layout structures to build functional user interfaces.	K2
CO-3	apply Dart programming concepts, form validation, and animations to create interactive and responsive mobile applications	K3
CO-4	analyze and implement app navigation, structured widget trees, and scrolling effects to enhance the app's functionality and user experience	K4
CO-5	design & develop complete mobile applications by integrating widgets, animations, and navigation techniques using Flutter.	K5

SEMESTER IV			
Skill Enhancement Course IV (Discipline Specific)	**Design Thinking with Flutter(Lab)**		
Course Code:24UCSSE4	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits: 2**

Unit – I

Introducing Flutter - Understanding Widget Lifecycle Events - Installing the Flutter SDK – Creating a Simple App – Learning Dart Basics: Variables – Operators – Flow Statements –Functions – Packages – Classes.

Unit –II

Creating a Starter Project Template – Creating and Organizing Folders &Files- Structuring Widget tree- Understanding the Widget Tree.

Unit –III

Using Common Widgets: Basic Widgets – Row – Buttons – Images and Icons – Decorators – Using form widgets to validate Text Fields – Adding Animation to an App.

Unit –IV

Creating an App's Navigation – Using Hero Animation – BottomNavigationBar & BottomAppBar – TabBar and TabBar view – Drawer and Listview – Creating Scrolling Lists and Effects

Unit –V

Building Layouts- A High-Level View of the Layout

Text Book:

1. Marco.L.Napoli– Beginning Flutter-A Hands on Guide to App Development, Published by John Wiley & Sons, Inc.

Reference Books:

1. Flutter & Dart: Up & Running by D Chopra/ R Khurana
2. Ultimate Flutter Handbook by Lahiru Rajeendra Mahagamage.
3. Flutter for Beginners by Alessandro Blessek

PSO Relation Matrix (Course Code: 24USSE4)

Course	**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	2	3	3	2	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	2	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**2.6**	**3**	**3**	**2.6**	**3**	**3**	**3**

SEMESTER IV			
Ability Enhancement Course IV Graphic Design			
Course Code: 24UACS41	**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 IV Graphic Design			
Course Code: 24UACS41	**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

PSO Relation Matrix (Course Code: 24UACS41)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER V			
Core V	**.NET Programming**		
Course Code: 24UCSC51	**Hrs/week:5**	**Hrs. / Semester: 75**	**Credits:4**

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: 24UCSC51	**Hrs. / week:5**	**Hrs. / Semester: 75**	**Credits:4**

Unit I:

Overview of .NET framework and C# Language: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.

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: 24UCSC51)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	2	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**2.8**	**2.8**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER V			
Core VI	**Operating Systems**		
Course Code: 24UCSC52	**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 V			
Core VI	**Operating Systems**		
Course Code: 24UCSC52	**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: 24UCSC52)

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	3	3	3	3	3	3	3
CO-2	3	2	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	2	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**2.8**	**3**	**2.8**	**3**	**3**	**3**	**3**	**3**

SEMESTER V			
Core VII	**Data Mining and Warehousing**		
Course Code:24UCSC53	**Hrs/week: 5**	**Hrs / Semester: 75**	**Credits:4**

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 mining with various technologies.	K4
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:24UCSC53	**Hrs / week :5**	**Hrs / Semester: 75**	**Credits :4**

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- Split algorithm based on information theory and Gini Index 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: 24UCSC53)

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	3	3	3	3	3	3	3
CO-2	3	3	2	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	**3**	**3**	**2.8**	**2.8**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER V			
Core VIII	**Software Engineering and Testing**		
Course Code:24UCSC54	**Hrs. / week:5**	**Hrs. / Semester: 75**	**Credits:4**

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	recall fundamental concepts of software engineering, including software life cycle models, project management strategies, and coding standards.	K1
CO-2	Explain the characteristics of good software design, user interface design principles, and key attributes of effective SRS documentation.	K2
CO-3	Apply appropriate software development models (e.g., Waterfall, Agile, Spiral) and testing strategies (e.g., Black-box, White-box) to implement and verify software solutions.	K3
CO-4	Analyze the impact of risk management, software reliability models, and CASE tools in improving software quality and project success.	K4
CO-5	Evaluate various software maintenance models, reverse engineering techniques, and project cost estimation strategies to enhance software sustainability.	K5

SEMESTER V			
Core VIII	**Software Engineering and Testing**		
Course Code:24UCSC54	**Hrs. / week:5**	**Hrs. / Semester: 75**	**Credits:4**

Unit I:

Introduction: Evolution - From an Art Form an Engineering Discipline**;** Evolution of an Art into an Engineering Discipline**;** Evolution of an Art into an Engineering style of Discipline-Evolution Pattern for Engineering Disciplines - A Solution to a Software Crisis - Software Development of Projects**;** Program versus Product – Types of Software Development Projects**;** Software products-Software Services -Exploratory style of Software development**;** What is wrong with exploratory style of software development-The emergence of Software Engineering; Computer Systems Engineering**;**

Software Life Cycle Models: A few Basic Concepts; Waterfall Model and its Extension; Classical Waterfall Model – Iterative Waterfall Model – V-model**;** Prototyping Model **;** Incremental Development Model**;** Evolutionary Model **;** Rapid Application Development (RAD)**;** Working of RAD-Applicability of RAD- Model-Comparison of RAD with other Models**;** Agile Development Models **;** Essential idea behind Agile Models-Advantages and disadvantages of agile methods -Agile versus Other Models -Scrum Model - Spiral Model **;** Phases of txhe Spiral Model

Unit II:

Software Project Management: Software Project management complexities**;** Responsibilities of a Software Project Manager**;** Project Planning; **Risk** Management**;**

Requirements Analysis and Specification :- Requirements Gathering and Analysis **;** Software Requirements Specifications (SRS) **;** Users of SRS Document – Characteristics of a Good SRS Document –Attributes of bad SRS documents- -Important Categories of Customer Requirements**-** Functional Requirements – Identify the Functional Requirements– Traceability- Organisation of the SRS Document.

Software Design: Overview of the Design Process**;** Outcome of the Design Process – Classification of Design Activities – Classification
Design Methodologies- Characteristics of a Good Software Design; Cohesion and Coupling;
Classification of Cohesiveness - Classification of Coupling.

Unit III :

Function-Oriented Software Design: Overview of SA/SD Methodology **;** Structured Analysis **;** Data flow diagrams(DFDs) **-**Developing the DFD Model of a System **;** Structured Design **;** Detailed Design **;** Design Review.

User Interface Design: Characteristics of a good User Interface **;** Basic Concepts **;** Types of User Interfaces **;** Fundamentals of Components-based GUI Development **;** Window System- Types of Widgets.

Unit IV :

Coding and Testing: Coding- Coding standards and guidelines - Code review- code Walkthrough Software Documentation;– Testing;- testing in the large vs testing in the small; Unit Testing; – Black-box Testing;- Equivalence Class Partitioning – Boundary Value Analysis – White-box Testing; Debugging; Program analysis tools; integration testing; system testing; some general issues associated with testing.
Software Reliability and Quality Management: Software Reliability; Statistical testing; Software Quality; Software Quality Management System; ISO 9000; SEI Capability Maturity Model

Unit V :

Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment.

Software Maintenance: Characteristics of Software Maintenance; Software Reverse Engineering; Software Maintenance process models; Estimation of maintenance cost.

Text Book:

1. RajibMall, Fundamentals of Software Engineering Fifth Edition, PHI Learning Private Limited 2018.

Books for Reference:

1. Ian Sommerville, *"Software Engineering"*, 10th Edition, Pearson Education Asia, **2015**
2. Roger S. Pressman and Bruce R. Maxim, Software Engineering; A Practitioner‘s Approach (9th Edition), McGraw-Hill, 2020
3. K L James, Software Engineering 2nd Edition, PHI, 2015

PSO Relation Matrix (Course Code: 24UCSC54)

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	3	2	2	3	2	3	3
CO-2	2	2	2	3	2	2	3	2	3	3
CO-3	3	3	3	3	3	3	2	3	2	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	**2.6**	**2.6**	**2.6**	**2.8**	**2.6**	**2.6**	**2.8**	**2.6**	**2.8**	**3**

SEMESTER V			
Core Practical V	**. NET Programming Lab**		
Course Code:24UCSCR5	**Hrs/week: 4**	**Hrs. / Semester: 60**	**Credits:3**

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

SEMESTER V			
Core Practical V . NET Programming Lab			
Course Code:24UCSCR5	**Hrs/week: 4**	**Hrs. / Semester: 60**	**Credits:3**

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.

PSO Relation Matrix (Course Code: 24UCSR5)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER V			
Discipline Specific Elective I	**IoT and its Applications**		
Course Code:24UCSE51	**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:24UCSE51	**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:24UCSE51)

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	3	3	2	2	2	2	3
CO-2	2	3	2	3	3	2	3	2	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	2	2	3	3	3	3	3
Ave.	**2.6**	**2.8**	**2.6**	**2.8**	**2.8**	**2.6**	**2.8**	**2.6**	**2.8**	**3**

SEMESTER V			
Discipline Specific Elective I Smart Devices Programming			
Course Code: 24UCSE52	**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: 24UCSE52	**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: 24UCSE52)

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	2	2	2	2	3	3	3
CO-2	3	3	3	3	3	3	2	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**2.8**	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**

SEMESTER V			
Skill Enhancement Course V (Discipline Specific)	**Recent Trends in Computing**		
Course Code: 24UCSSE5	**Hrs/Week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Objectives:

- To understand the principles and architecture of edge computing and Quantum computing.
- To Explore real-world applications of ML and DL.
- To explain the fundamentals of NLP and its role in human-computer interaction.

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	CL
CO-1	recall the basic concepts of edge computing, Quantum computing, Machine Learning, NLP	K1
CO-2	explain the advantages and applications in real-world scenarios.	K2
CO-3	apply basic techniques to build new models using Python.	K3
CO-4	write and simulate basic programs using Python	K4
CO-5	classify various algorithms in various Technologies.	K5

SEMESTER V			
Skill Enhancement Course V Recent Trends in Computing (Discipline Specific)			
Course Code: 24UCSSE5	**Hrs/Week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Unit I:

What Is Edge Computing-Why Do We Need Edge Computing-Key Techniques that Enable Edge Computing-Edge Computing Definition-Edge Computing Benefits-Edge Computing Systems

Unit II:

Machine Learning- ML Categories-The ML Toolbox-Advanced Toolbox-Data Scrubbing-Setting Up Your Data.

Regression Analysis-Linear regression-logistic regression-Decision tree-Support Vector Machine-Clustering-K-means clustering-hierarchical clustering -Building A Model in Python

Unit III:

Introduction to Deep learning-Deep learning Models-SLP-MLP-CNN Architecture- RNN Architeture.

Unit IV:

Classical Approaches to Natural Language Processing- Rule-based vs. statistical NLP models-The Classical Toolkit - Tokenization, stemming, lemmatization, stop-word removal-Text Preprocessing - Challenges of Text Preprocessing - Ambiguity, polysemy, sparse data issues-Tokenization - Sentence Segmentation - POS tagging, chunking, syntactic parsing.

Unit V: Quantum Computing : Classical vs. quantum computing-Why Does Quantum Computing Matter?- What Can Quantum Computers Do?- How Will We Use Quantum Computers?- What Can't Quantum Computers Do?- What Is A Quantum Program?

Book: Learn Quantum Computing with Python and Q# by Sarah Kaiser, Chris Granade

Text Books:

1. A Primer by Jie Cao ,Quan Zhang , Weisong Shi ,"*Edge Computing*" Springer publication
2. Oliver Theobald, "*Machine Learning For Absolute Beginners*"
3. Taweh Beysolow II, "*Introduction to Deep Learning Using R*"
4. Nitin Indurkhya Fred J. Damerau, "*Handbook Of Natural Language Processing Second Edition Edited* "
5. Sarah Kaiser, Chris Granade," *Learn Quantum Computing with Python and Q#* "

Reference Books:

1. *Sebastian Raschka, Vahid Mirjalili,"*Python Machine Learning", Packt Publishing, 3rd Edition.
2. *Andreas C. Müller, Sarah Guido, O'Reilly Media*, Introduction to Machine Learning with Python
3. Chris Bernhardt, "Quantum Computing for Everyone",The MIT Press,2019
4. *Anand Nayyar, Akshi Kumar,"* Architecting the Internet of Things with Edge and Cloud Computing", CRC Press,2022
5. *Chris Bernhardt*, "Quantum Computing for Everyone",The MIT Press,2019
6. *Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana* ,"Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP, O'Reilly Media,2020

PSO Relation Matrix (Course Code: 24UCSSE5)

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	3	2	2	2	3	3	3
CO-2	3	3	3	3	3	3	2	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**2.8**	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**

SEMESTER V	
Self-Study 2	**Mathematical Reasoning**
Course Code: 24UCSSS2(Optional)	**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 2 **Mathematical Reasoning**	
Course Code: 24UCSSS2(Optional)	**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, 13,10,11,24,22,15,17

PSO Relation Matrix (Course Code: 24UCSSS2)

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	2	3	3	3	3	3	3
CO-2	3	3	3	2	3	3	3	3	2	3
CO-3	3	3	3	2	3	3	3	3	2	3
CO-4	3	3	3	2	3	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	2	3
Ave.	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2.4**	**3**

SEMESTER VI			
Core IX	**Data Analytics using R**		
Course Code: 24UCSC61	**Hrs / week:6**	**Hrs / Semester:90**	**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: 24UCSC61	**Hrs./week:6**	**Hrs. / Semester:90**	**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: 24UCSC61)

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	2	2	2	2	3	3	3
CO-2	3	3	3	3	3	3	2	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**2.8**	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**

SEMESTER VI			
Core X	**Computer Networks**		
Course Code:24UCSC62	**Hrs / week:5**	**Hrs / Semester:75**	**Credits:5**

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:24UCSC62	**Hrs./week:5**	**Hrs. / Semester:75**	**Credits:5**

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, 24.1-24.2,

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: 24UCSC62)

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	2	3	3	3	3	2	3
CO-2	3	3	3	2	2	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**2.6**	**2.8**	**3**	**3**	**3**	**2.8**	**3**

SEMESTER VI			
Core XI	**Big Data Analytics**		
Course Code: 24UCSC63	**Hrs / week:5**	**Hrs / Semester: 75**	**Credits:5**

Objectives:

- To implement MapReduce programs for processing big data.
- To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
- To analyze big data using machine learning techniques.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define and list various Big Data concepts, tools and applications.	K1
CO-2	demonstrate programs using HADOOP framework	K2
CO-3	identify Hadoop Cluster to deploy Map Reduce jobs, PIG,HIVE and Spark programs	K3
CO-4	analyze the given data set and identify deep insights from the data set.	K4
CO-5	compare various unstructured database	K5

SEMESTER VI			
Core XI	**Big Data Analytics**		
Course Code: 24UCSC63	**Hrs / week:5**	**Hrs / Semester: 75**	**Credits:5**

Unit I:

Intoduction: Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data,Typical data warehouse and Hadoop environment.

Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools , NoSQL, Hadoop

Unit II:

Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System),Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator).

Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting,

Unit III:

Introduction to MongoDB: What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language**.**

Unit IV:

Introduction to Hive: What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF).

Introduction to Pig: What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive.

Unit V:

Spark and Big Data Analytics: Spark, Introduction to Data Analysis with Spark. Text, Web Content and Link Analytics: Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph.

Text Books:

1. Seema Acharya and Subhashini Chellappan "*Big data and Analytics*" Wiley India Publishers, 2nd Edition, 2019.

2. Rajkamal and Preeti Saxena, "*Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning*", McGraw Hill Publication, 2019.

Books for Reference:

1. Adam Shook and Donald Mine, "*MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems*" ,Reilly 2012

2. Tom White, "*Hadoop: The Definitive Guide*" 4th Edition, O'reilly Media, 2015.

3. Thomas Erl, Wajid Khattak, and Paul Buhler, "*Big Data Fundamentals: Concepts, Drivers and Techniques"*, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016

PSO Relation Matrix (Course Code: 24UCSC63)

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	2	2	2	2	3	3	2	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	2	3	3	3
CO-5	2	3	3	3	3	3	3	3	3	3
Ave.	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**2.8**	**2.8**	**3**	**3**

SEMESTER VI			
Core Practical VI	**R Programming Lab**		
Course Code: 24UCSCR6	**Hrs. / week :4**	**Hrs. / Semester:60**	**Credits :3**

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

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SEMESTER VI			
Core Practical VI	**R Programming Lab**		
Course Code: 24UCSCR6	**Hrs. / week :4**	**Hrs. / Semester:60**	**Credits :3**

Practical List

1. Program using Control Structures.
2. Create a function to print squares of numbers in sequence.
3. Create a Data Frame 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.

PSO Relation Matrix (Course Code: 24UCSCR6)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	2	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**2.8**	**3**	**3**	**3**	**3**	**3**

SEMESTER VI			
Core XII (Project)	**Project and Viva Voce**		
Course Code: 24UCSP61	**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

PSO Relation Matrix (Course Code: 24UCSP61)

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	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SEMESTER VI			
Discipline Specific Elective II	**Cloud Computing**		
Course Code:24UCSE61	**Hrs/week:4**	**Hrs. / Semester:60**	**Credits :4**

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: 24UCSE61	**Hrs. / week:4**	**Hrs. / Semester: 60**	**Credits :4**

Unit I:

Definining 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.

Understanding Services and Applications by Types: 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:

Working with Cloud based Storage: Cloud storage definition – unmanaged cloud storage – managed cloud storage – creating cloud storage systems –Exploring Cloud Backup Solutions - Backup types - Cloud Backup features – cloud attached backup

Using 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: 24UCSE61)

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	2	3	2	2	3	3	3	3	3
CO-2	3	3	2	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**	**3**	**3**

SEMESTER VI			
Discipline Specific Elective II	**Cyber Forensics**		
Course Code: 24UCSE62	**Hrs. / week:4**	**Hrs. / Semester:60**	**Credits:4**

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: 24UCSE62	**Hrs / week :4**	**Hrs/Semester: 60**	**Credits:4**

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.

PSO Relation Matrix (Course Code: 24UCSE62)

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	2	2	2	2	3	3	2	2	2
CO-2	3	3	3	3	3	3	3	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3
Ave.	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**3**	**2.8**	**2.8**	**2.8**