

DEPARTMENT OF COMPUTER APPLICATIONS (BCA)

CHOICE BASED CREDIT SYSTEM (CBCS) Learning Outcome-based Curriculum Framework (LOCF) SYLLABUS

2023 - 2024



**MADRAS CHRISTIAN COLLEGE
(AUTONOMOUS)**

College with Potential for Excellence
Affiliated to University of Madras
Tambaram
Chennai – 600 059

Madras Christian College
Department of Computer Applications (BCA)

PROGRAMME SPECIFIC OUTCOMES (PSO)

At the time of graduation, they would be able to:

PSO #	Statement	Mapped with PO#
PSO 1	Achieve competence in software through knowledge gain in the principles and functioning of the computer technologies.	PO1, PO2, PO4
PSO 2	Analyze and formulate ideas for theoretical and practical conceptualization of programming languages along with the in-depth knowledge of the computer domain.	PO1, PO2, PO4
PSO 3	Identify the complex problems and design sustainable solutions incorporating the digital technology to compete with the global demand.	PO2, PO3, PO4, PO5, PO6, PO8
PSO 4	Analyze the phases of project development and contribute to the design and development of software with the aid of technical expertise leading to career advancement in par with the trending technology.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8
PSO 5	Acquire knowledge to deliver strategies with professional standard for collaborative environment using scientific reasoning through computing skills as an application developer or an entrepreneur.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8

Curriculum

(Effective from 2023-24)

Semester	Part	Course code	Course title	Instruction hours per Cycle	Duration of exam	Marks			Credits
						ICA	ESE	Total	
1	Part I		Language	4	3	50	50	100	3
	Part II		English	4	3	50	50	100	3
	Part III		C Programming	5	3	50	50	100	5
	Part III		C Programming Lab	5	3	50	50	100	3
	Part III		Mathematics for Computer Applications - I	6	3	50	50	100	5
	Part IV		General Course –Office Automation	4	3	50	50	100	2
	Part IV		Value Education	2	3	50	50	100	1
2	Part I		Language	4	3	50	50	100	3
	Part II		English	4	3	50	50	100	3
	Part III		Data Structures	5	3	50	50	100	5
	Part III		Data Structures Lab	5	3	50	50	100	3
	Part III		Mathematics for Computer Applications - II	6	3	50	50	100	5
	Part IV		General Course – Office Automation	4	3	50	50	100	2
	Part IV		Value Education	2	3	50	50	100	1
3	Part I		Language	4	3	50	50	100	3
	Part II		English	4	3	50	50	100	3
	Part III		Object Oriented Programming using Java	5	3	50	50	100	5
	Part III		Object Oriented Programming using Java Lab	5	3	50	50	100	3
	Part III		Allied – Computer Integrated Statistical Methods and Optimization Technique–I / System Management – I (Agile Project Management)	6	3	50	50	100	5
	Part IV		Inter-Disciplinary Elective – Ecommerce Technologies	4	3	50	50	100	3
	Part IV		Environmental Studies	4	3	50	50	100	-
	Part IV		Personality Development	2	3	50	50	100	-
4	Part I		Language	4	3	50	50	100	3
	Part II		English	4	3	50	50	100	3
	Part III		Python Programming for Data Science	5	3	50	50	100	5
	Part III		Python Programming for Data Science Lab	5	3	50	50	100	3
	Part III		Allied – Computer Integrated Statistical Methods and Optimization Technique–II / System Management –II (OOAD)	6	3	50	50	100	5
	Part IV		Inter-Disciplinary Elective – E-Commerce Technologies	4	3	50	50	100	-
	Part IV		Environmental Studies	4	3	50	50	100	2
5	Part III		PHP and MySQL	5	3	50	50	100	4
	Part III		PHP and MySQL Lab	5	3	50	50	100	3
	Part III		Cloud Computing and Block Chain Management	4	3	50	50	100	4
	Part III		Operating Systems	5	3	50	50	100	4
	Part III		Internet of Things (or) Front End Development (or) Advanced Database Concepts	5	3	50	50	100	4
				3	50	50	100		
				3	50	50	100		
	Part IV		General Elective – Web Design	4	3	50	50	100	3
Part IV		Skilled Based Training–System Administration and DevOps	2	3	50	50	100	3	
6	Part III		Programming .NET using C#	5	3	50	50	100	4
	Part III		Programming .NET using C# Lab	5	3	50	50	100	3
	Part III		Data Communications and Networking	4	3	50	50	100	4
	Part III		Software Engineering	5	3	50	50	100	4
	Part III		Android and its Applications (or) Artificial Intelligence (or) Cyber Security	5	3	50	50	100	4
				3	50	50	100		
				3	50	50	100		
		Project	6	3	50	50	100	5	
	Part V		Extension Activities					1	
Total Credits									140

SEMESTER I**C Programming**

Course Code			
Credits	5		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	I		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To gain knowledge in C language.) To inculcate fundamental programming skills.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remember the fundamentals and program structure of C	PSO 1, PSO 2	K1
CO 2	Understand the programming principles in C	PSO1, PSO2	K2
CO 3	Apply the programming principles learnt to solve the real-time problems	PSO2, PSO3, PSO4	K3
CO 4	Analyse the various techniques of solving a problem and choose the best one.	PSO3, PSO4, PSO5	K4
CO 5	Code, debug and test the programs with appropriate test cases	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	<p>Overview of C: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables-Assignment statement, declaring a variable as constant, as volatile.</p> <p>Operators and Expression: Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators, arithmetic expressions, operator precedence, type conversions, mathematical functions.</p> <p>Managing Input and Output Operators: Reading and writing a character, formatted input, formatted output.</p>	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5

II	Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE ELSE IF ladder, switch, GOTO statement. Decision Making and Looping: While, Do-While, For, Jumps in loops.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
III	Arrays: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays. Functions: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
IV	Structures and Unions: Defining, giving values to members, initialization and comparison of structure variables, arrays of structure, arrays within structures, structures within structures, structures and functions, unions. Pre-processors: Macro substitution, file inclusion.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
V	Pointers: Definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures. File Management in C: Opening, closing and I/O operations on files, random access to files, command line arguments.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
Prescribed Books/Textbooks 1. E. Balagurusamy, Programming in ANSI C, 8 th Edition, Tata McGraw-Hill, 2019. 2. C: THE COMPLETE REFERENCE, Herbert Schildt, 4 th Edition, Mc Graw Hill– 2017				
References 1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018. 2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998. 3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021				
Suggested Reading 1. Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw-Hill, 2017 2. Zed A. Shaw, Learn C the Hard Way, Pearson Education, 2015.				
Web Resources 1. https://www.tutorialspoint.com/cprogramming 2. https://www.javatpoint.com/c-programming-language-tutorial 3. https://www.learn-c.org				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	3	3	-	3	-	-	-	-	3	3	-	-	-	K2
CO 3	2	3	3	3	3	3	3	3	-	3	3	3	-	K3
CO 4	2	3	3	3	3	3	3	3	-	-	3	3	3	K4
CO 5	2	3	3	3	3	3	3	3	-	-	3	3	3	K5
Wt. Avg.	2.4	3	3	3	3	3	3	3	3	3	3	3	3	
Wt. Avg.	2.9								3.0					

C Programming Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	I		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To implement programming skills using C) To impart knowledge and provide efficient solutions for real time problems using C language		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remember the basic syntax and semantics in C	PSO1, PSO2	K1
CO 2	Understand programs written in C language	PSO1, PSO2	K2
CO 3	Apply the Programming concepts to solve problems	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Analyse and Design algorithms and write programs in C language for the given problems.	PSO3, PSO4, PSO5	K4
CO 5	Evaluate the program execution flow with test cases.	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Variables, Data types, Constants and Operators 1. Evaluation of an expression ex: $((x+y)^2 * (x+z))/w$ 2. Temperature conversion problem (Fahrenheit to Celsius) 3. Program to convert days to months and days (Ex: 364 days = 12 months and 4 days) 4. Solution of quadratic equation 5. Calculation of Salesman salary (Given: Basic Salary, Bonus for every item sold, commission on the total monthly sales)	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
II	Decision making Statements 6. To find the Maximum of three numbers 7. Calculate Square root of five numbers	15	CO1 CO2 CO3	K1, K2, K3, K4, K5

	8. Pay-Bill Calculation for different levels of employee 9. Fibonacci series 10. Floyds Triangle 11. Pascal's Triangle		CO4 CO5	
III	Arrays, Functions and Strings 12. Prime numbers in an array 13. Sorting data (Ascending and Descending) 14. Matrix Addition and Subtraction 15. Matrix Multiplication 16. Function with no arguments and no return values 17. Function that convert lower case letters to upper case 18. Factorial using recursion. 19. Perform String Operations using Switch Case.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
IV	Structures and Macros 20. Structure that describes a Hotel (name, address, grade, avg room rent, number of rooms) 21. Perform some operations (list of hotels of a given grade etc.) 22. Using Pointers in Structures. 23. Cricket team details using Union. 24. Write a macro that calculates the max and min of two numbers 25. Nested macro to calculate the Cube of a number.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
V	Pointers and Files 26. Evaluation of Pointer expressions 27. Function to exchange two pointer values 28. Insertion and deletion in an array using pointers 29. Program to read a file and print the data. 30. Program to receive a file name and a line of text as command line argument and write the text to the file 31. Program to copy the content of one file to another file.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
Textbooks 1. E. Balagurusamy, Programming in ANSI C, 8 th Edition, Tata McGraw-Hill, 2019. 2. C: THE COMPLETE REFERENCE, Herbert Schildt, 4 th Edition, Mc Graw Hill– 2017				
References 1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018. 2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998. 3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021.				

Suggested Reading

1. Herbert Schildt, C: The Complete Reference , Fourth Edition, McGraw-Hill, 2017
2. Zed A. Shaw, Learn C the Hard Way, Pearson Education, 2015.

Web Resources

1. <https://www.tutorialspoint.com/cprogramming>
2. <https://www.javatpoint.com/c-programming-language-tutorial>
3. <https://www.w3schools.in/category/c-tutorial>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	-	3	-	-	-	-	3	3	-	-	-	K2
CO 3	2	3	3	3	3	3	3	3	3	3	3	3	3	K3
CO 4	2	3	3	3	3	3	3	3	-	-	3	3	3	K4
CO 5	2	3	3	3	3	3	3	3	-	-	3	3	3	K5
Wt. Avg.	2	3	3	3	3	3	3	3	3	3	3	3	3	
Wt. Avg.	2.8								2.9					

Mathematics for Computer Applications -I

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	I		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To recall the concepts learnt in the secondary level) To understand the operations on numbers using different methods		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Know how to identify the kind of series and terms.	PSO1, PSO2	K1
CO 2	Explain about various types of matrices and various operations performed on them.	PSO1, POS2, PSO3	K2
CO 3	Construct the roots of polynomial, understanding symmetric roots and relation between them.	PSO2, PSO3, PSO4, PSO5	K3
CO 4	Examine simple techniques to solve simple Polynomials	PSO1, PSO2, PSO4, PSO5	K4
CO 5	Explain the concepts of Trigonometric functions	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Partial Fractions - Binomial theorem - Exponential Series - Logarithmic Series (SimpleProblems only)	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Matrix Algebra- Meaning and operations- Matrix inversion- solutions to linear equations	20	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Theory of equations- polynomial and its roots, Symmetric functions of roots, reciprocal equation	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Theory of equations- Diminished roots, Descarte's rule of signs, Newtons method, Horner's method.	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

V	Trigonometry- Expansions of $\sin(n)$ and $\cos(n)$ in a series of powers of \sin and \cos - Expansions of $\sin n$, $\cos n$, $\tan n$ in a series of sines, cosines and tangents of multiples of “ ” - Expansions of \sin , \cos and \tan in a series of powers of “ ” – Hyperbolic and inverse hyperbolic functions .	20	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
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Textbooks

1. P.R Vittal ,Business Mathematics , Margham Publications, Chennai

Unit-1: pp236 to 291, Chapter 9, Chapter 10.

Unit-2: pp595 to 653, Chapter 14.

2. S.G Venkatachalpathy ,Allied Mathematics, Margham Publications, Chennai

Unit-3: pp5.1 to 5.32, Chapter 5,

Unit-4: pp5.34 to 5.54, Chapter 5,

Unit-5:pp8.1 to 8.56, Chapter 8.

References

1. Vittal P. R., Allied Mathematics, Margham Publications, Chennai, Reprint 2016

2. Narayanan S., Manicavachagom Pillay T K., Ancillary Mathematics, S. Viswanathan Printers and Publishers, Reprint, 2003.

Suggested Reading

1. Duraipandian and S. Udayabaskaran, Allied Mathematics, Volume I and II, by P. S. Chand Publications.

2. Dr. A. Singaravelu, Allied Mathematics ,Meenakshi Agency.

Web Resources

1. <http://www.edurite.com/kbase/application-of-matrices-in-real-life>

2. <https://www.vedantu.com/iit-je/theory-of-equations>

3. <https://www.geeksforgeeks.org/progression-aptitude-questions>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	2	-	-	-	-	2	3	-	-	-	K1
CO 2	2	3	3	2	2	2	-	2	2	3	2	-	-	K2
CO 3	2	3	3	2	2	2	1	1	-	3	2	1	1	K3
CO 4	2	3	3	2	3	2	2	1	3	3	-	2	2	K4
CO 5	2	3	3	2	3	2	2	2	-	-	2	2	3	K5
Wt. Avg.	2.2	3	3	2	2.5	2	1.7	1.5	2.3	3	2	1.7	2	
Wt. Avg.	2.2								2.2					

SEMESTER II**Data Structures**

Course Code			
Credits	5		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	II		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To equip students with a basic understanding of data structure concepts.) Inculcate in-depth knowledge to write programs based on data structure techniques.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	To list and recall the basic concepts of data structure	PSO 1, PSO2	K1
CO 2	To explain the different types of data structures	PSO 1, PSO 2, PSO 3	K2
CO 3	To experiment with various operations like searching, sorting etc.	PSO 2, PSO 3	K3
CO 4	Analyse various algorithms in problem solving	PSO 2, PSO 3, PSO 4, PSO 5	K4
CO 5	To measure and analyse the efficiency of algorithms used in searching, sorting and traversing	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: Basic Terminology, elementary data, Organization, Data structure, Time vs Space complexity, Algorithmic Notation, Control structures, Complexity of algorithms	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Arrays: Introduction, Linear arrays, representation of linear arrays in memory, Traversing Linear arrays, Inserting & Deleting; Searching - Linear search-Binary search; Sorting-Bubble sort-Selection sort-Insertion sort.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Linked Lists: Introduction, representation of Linked list in memory, traversing a linked list, Searching a linked list, Insertion into a linked list, Deletion from a linked list.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	Stacks: Introduction, Stacks, array representation of stacks, Linked representation of stacks. Recursion: Tower of Hanoi, Queues: Linked representation of Queues, Deques.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	TREES: Introduction, Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees, Searching and Inserting in Binary Search Trees, Deleting in a Binary Search Tree. Graphs: Introduction, Representation to Graphs, Graph Traversals, Shortest Path Algorithm	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Seymour Lipschutz, Data structures, 2017, Schaums Series, Tata Mc-Graw Hill

References

1. Tanaenbaum A.S. Langram Y. Augestein M.J, Data Structures using C, Pearson Education 2004.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003.

Suggested Reading

1. Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition.

Web Resources

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.techtarget.com/searchdatamanagement/definition/data-structure>
3. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm

Course Articulation Matrix

Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	-	3	-	-	-	-	3	2	-	-	-	K1
CO2	2	3	2	3	2	3	-	2	2	3	2	-	-	K2
CO3	1	3	3	3	2	3	-	3		3	3	-	-	K3
CO4	1	3	1	3	2	3	3	2		3	3	2	2	K4
CO5	2	3	2	3	2	3	3	2		-	3	2	2	K5
Wt. Avg.	1.6	3	1.6	3	2	3	3	2	2.5	2.8	2.8	2	2	
Wt. Avg.	2.4								2.4					

Data Structures Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	II		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To equip students with a basic understanding of data structure concepts.) Inculcate in-depth knowledge to write programs based on data structure techniques.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Understand and implement different types of data structures	PSO 1, PSO 2	K1
CO 2	Perform various operations on the data structures	PSO 1, PSO 2, PSO 3	K2
CO 3	Perform searching, sorting etc.	PSO 2, PSO 3	K3
CO 4	Apply various algorithms in problem Solving	PSO 2, PSO 3, PSO 4, PSO 5	K4
CO 5	Critically analyse the efficiency of algorithms used in searching, sorting and traversing	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	1. Implementation of Bubble Sort 2. Implementation of Selection Sort 3. Implementation of Insertion Sort	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	4. Implementation of Linear Search 5. Implementation of Binary Search	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	6. Implementation of Linked List a. Insertion b. Deletion c. Traversal	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	7. Implementation of Stack 8. Implementation of Queue	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	9. Implementation of Tower of Hanoi Problem 10. Implementation of Binary Tree 11. Implementation of Tree Traversal Implementation of Binary Search Tree	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Seymour Lipschutz, Data structures, 2017, Schaums Series, Tata Mc-Graw Hill

References

1. Tanaenbaum A.S. Langram Y. Augestein M.J, Data Structures using C, Pearson Education 2004.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003.

Suggested Reading

1. Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition.

Web Resources

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.techtarget.com/searchdatamanagement/definition/data-structure>
3. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	2	-	-	-	K1
CO 2	2	3	2	3	2	3	-	2	2	3	2	-	-	K2
CO 3	1	3	3	3	2	3	-	3	-	3	3	-	-	K3
CO 4	1	3	1	3	2	3	3	2	-	3	3	2	2	K4
CO 5	2	3	2	3	2	3	3	2	-	-	3	2	2	K5
Wt. Avg.	1.6	3	1.6	3	2	3	3	2	2.5	2.8	2.8	2	2	
Wt. Avg.	2.4								2.4					

Mathematics for Computer Applications –II

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	II		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To gain knowledge about discrete structures, mathematical logic, and combinatorics.) To learn about graph structures and graph algorithms.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Define the concepts of Logic and its applications	PSO2, PSO3, PSO4, PSO5	K1
CO 2	Demonstrate the sets and relations	PSO2, PSO3, PSO4, PSO5	K2
CO 3	Apply the concepts of combinatorics	PSO2, PSO3, PSO4, PSO5	K3
CO 4	Inspect the concepts of graph theory and develop simple proofs for some standard theorems	PSO2, PSO3, PSO4, PSO5	K4
CO 5	Explain the concepts of trees and graph algorithms	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Mathematical Logic: Introduction- propositions-connectives-conditional and Biconditional propositions-Tautology and contradiction - Equivalence of Propositions - Duality Theorem - Algebra of Propositions – Tautological implication- Normal forms (using truth table only)	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4 K5
II	Set Theory: Introduction – Basic concepts and notations - Ordered pairs and cartesian products – set operations – Relations- Types of relations – Some operations on relations – Composition of relations – Properties of relations - Equivalence classes – Matrix representation of relations - Hasse Diagrams for Partially Orderings	17	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4 K5
III	Combinatorics: Introduction - Permutations and Combinations - Pascal's Identity - Pigeonhole Principle - Generalization of the Pigeonhole Principle - Principle of Inclusion-Exclusion – Mathematical Induction - Recurrence Relations (Definition only)	17	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	Introduction to Graph Theory: Introduction – Basic definitions – degree of a vertex – some special simple graphs – matrix representation of graphs – paths, cycles, and connectivity – Eulerian and Hamiltonian graphs	19	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,4, K5
V	Algorithmic Graph Theory: Connectedness in directed graphs – shortest path algorithms – trees – spanning trees – rooted and binary trees – binary tree – tree traversal – expression trees.	19	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Prescribed Books 1. Veerarajan T- Discrete Mathematics, with Graph Theory and Combinatorics - With Graph Theory and Combinatorics, McGraw Hill Publication. Unit 1 Sections 1.1- 1.12 Unit 2 Sections 2.1 -2.10, 2.13, 2.15 Unit 3 Sections 6.1,6.2,6.3, 6.7 – 6.11 Unit 4 Sections 7.1- 7.7 Unit 5 Sections 7.8 – 7.11, 7.13 – 7.16				
References 1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition 2. Seymour Lipschutz, Marc Lipson, Schaum's Outlines, Discrete Mathematics, III Edition 3. S. Arumugam - Invitation to Graph Theory, 2006 by Scitech Publications 4. Gary Chartrand & Ping Zhang, A First course in Graph Theory, CRC Press- 2012				
Suggested Reading 1. Purna Chandra Biswal, Discrete Mathematics and Graph Theory , 2015 PHI Publications 2. Edgar Goodaire, Michael Parmenter, Discrete Mathematics with Graph Theory (Classic Version), 2017, Pearson Publication				
Web Resources 1. https://www.cuemath.com/data/permutations-and-combinations 2. http://research.engineering.nyu.edu/~greg/discrete/resources.html 3. https://onlinecourses.nptel.ac.in/noc19_cs67/preview 4. https://ocw.mit.edu/				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	2	2	2	1	3	2	-	3	2	2	3	K1
CO 2	2	3	2	2	2	2	2	2	-	3	2	2	2	K2
CO 3	2	3	3	2	2	2	1	1	-	3	2	1	1	K3
CO 4	2	3	3	2	3	2	2	1	-	3	2	2	2	K4
CO 5	2	3	3	2	3	2	2	2	1	3	2	2	3	K5
Wt. Avg.	2	3	2.6	2	2.4	1.8	2	1.6	1	3	2	1.8	2.2	
Wt. Avg.	2.1								2.1					

Office Automation

Course Code			
Credits	2		
Hours / Cycle	4		
Category	Part IV	General Course	Theory
Semester	I/II		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) To enable the students in creating professional word documents.) To understand the usefulness and know how to use most Excel formulas and organize data in a spreadsheet.) To create, format, custom and develop a professional presentation.) To acquire knowledge on web browsers and E-mail services. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remembering how to document with formatting options and table design.	PSO1, PSO2, PSO3	K1
CO 2	Demonstrate relevant mathematical functions and formatting the cell in a spread sheet	PSO2, PSO3, PSO4	K2
CO 3	Develop a neat presentation with animation and transition.	PSO1, PSO2, PSO5	K3
CO 4	Analyze data with images, chart, and shapes in a document, spread sheet and slides.	PSO2, PSO3, PSO4	K4
CO 5	Explain internet technology and E-mail concepts.	PSO2, PSO3, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Word Processing Basics – Opening Word below Menu Bar, Opening and closing Documents - Opening Documents, Save and Save as, Page Setup, Print Preview, Printing of Documents. Text Creation and manipulation - Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Spell check. Formatting the Text - Font and Size selection, Alignment of Text, Paragraph Indenting, Bullets and Numbering, Changing case. Table Manipulation - Changing cell width and height, Alignment of Text in cell, Delete / Insertion of row and column, Merging, Splitting, Sorting, and Formula, Borders and shading. Drawing - Insert and Format Shapes, Word art, Inserting ClipArts	12	CO1 CO2	K1,K2,K3,K4, K5

	and Pictures. Tools –Mail merge, Digital Signature, water marking, Printing Documents.		CO3 CO4 CO5	
II	Working with Spread sheet - opening, Saving files, setting Margins, Converting files to different formats. Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells. Working with Data - Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart and Pictures.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Setting Formula -Mathematical operations, Using other Formulae. Formatting Spread sheet - Labelling columns & rows, Cell Alignment, Font, Border & Shading, Hiding/ Locking Cells, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Sheet. Formatting & style - Sheet background, Colour etc., Borders & Shading. Working with sheets – Sorting, Filtering, Validation, Consolidation, and Subtotal. Tools – Error checking, Spell Checks, Pivot Tables, Creating Charts, Printing.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Introduction to presentation – Opening & saving presentation, Different presentation templates, setting backgrounds, selecting presentation layouts. Creating a presentation - Setting Presentation style, Inserting And Deleting Slides,Adding text to the presentation. Formatting a Presentation - Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout, Inserting pictures, tables into presentation, Adding Effects to the Presentation - Setting Animation & transition effect, Automating a Slide Show.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Using the Internet - World Wide Web (WWW) - Web Browsing - Search Engines - Downloading Web Pages - Printing Web Pages - Understanding URL. Basics of E-mail -What is an Electronic Mail, Email Addressing, Opening Email account. Mailbox - Inbox and Outbox,Creating and Sending a new E-mail, Replying to an E-mail message, Forwarding an E-mail message, Sorting and Searching emails.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Archana Kumar, ” Computer Basics with Office Automation” , Dreamtech Press, 2019
2. Faithe Wempen, “Digital Literacy For Dummies”, 2014

References

1. Craig Zacker, “Microsoft Word 2016”, Microsoft Press, 2016.
2. Mary Lemons, “Microsoft PowerPoint 2016”, Microsoft Press 2016.

3. Greg Harvey, “Excel 2019 ALL-IN-ONE for Dummies”, 2018

Suggested Reading

1. John Lambert, “Microsoft Office 2016 Step by Step”, Microsoft Press 2016. First edition, 2016
2. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.

Web Resources

1. <https://www.tutorialspoint.com/word/index.htm>
2. <https://www.tutorialspoint.com/excel/index.htm>
3. <https://www.tutorialspoint.com/powerpoint>
4. https://www.poplarbluff.org/classes/eml_pkt.pdf

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	2	2	2	2	3	-	3	3	3	2	-	-	K1
CO 2	2	2	1	2	3	3	2	3	-	3	2	3	-	K2
CO 3	1	2	3	3	2	2	3	3	3	3	-	-	2	K3
CO 4	3	1	2	3	3	3	3	2	-	3	2	3	-	K4
CO 5	1	1	2	3	2	3	3	2	-	3	3	-	3	K5
Wt. Avg.	1.8	1.6	1.8	2.6	2.5	2.8	2.8	2.6	3	3	2.3	3	3	
Wt. Avg.	2.3								2.3					

SEMESTER III**Object Oriented Programming using Java**

Course Code			
Credits	5		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	III		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) To remember the concepts of object oriented concept) To understand the basic concepts of Java programming) To create java programs based on Inheritance and multithreading) To handle errors using the exceptional handling) To create java programs using packages, abstract class and interfaces. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remember the principles of object oriented programming.	PSO 1, PSO 2	K1
CO 2	Interpret the basic structure of Java program with class and objects using Strings and Arrays.	PSO 1, PSO 2	K2
CO 3	Develop programs using Multithreading and exceptional handling concepts.	PSO 2, PSO 3, PSO 4	K3
CO 4	Analyze the advantage of Packages, abstract class and Interface.	PSO 2, PSO 3, PSO 4	K4
CO 5	Appraise applications using AWT and event handling mechanisms.	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Java Language: Creation of JAVA, Java Buzzwords, Java magic code; Object-oriented programming. Data types, Variables & Arrays: The primitive types; Floating-point types; Characters; Booleans; Variables; Type conversion and casting; Arrays. Operators: Arithmetic operators; Bitwise operators; Relational operators; Boolean logical operators; Assignment operator; Conditional operator; Control Statements: Selection statements; Iteration statements; Jump statements.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Classes: Class fundamentals; Declaring Objects; Constructors; this keyword; Garbage Collection; finalize () method.	15	CO1 CO2 CO3	K1,K2,K3,K4, K5

	Methods: Overloading methods; Returning objects; Recursion; introducing access control; understanding static; introducing final; introducing nested and inner classes; Strings: String operations; Character Extraction; Comparing, Searching & Modifying the strings; Data conversion using value Of(); String Buffer Inheritance: Inheritance Basics; using super; creating a multilevel hierarchy; method overriding; dynamic method dispatch; using abstract classes; using final with inheritance.		CO4 CO5	
III	Packages and interfaces: Packages; access protection; importing packages; interfaces Multithread programming: The JAVA thread model; creating a thread; creating a multiple thread; Using isAlive() and join (), Thread Priorities, Synchronization, Interthread communication; suspending, resuming and stopping threads.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Exception handling: Exception handling fundamentals; Exception types; Uncaught exceptions; Using try and catch; Input/output: Java I/O classes and interfaces; file; The stream classes; The byte streams; character streams.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	JDBC – CRUD Operations using Java Event handling: Two event handling mechanisms; delegation event model; event classes; source of events; event listener interface. Working with AWT Classes	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. Herbert Schildt, JAVA: The Complete Reference, 11th Edition, Tata McGraw Hill, 2019 2. Bruce, Eckel, Thinking in Java, 3rd edition, Pearson education, 2005.				
References 1. Balagurusamy, Programming with Java, 6th Edition, McGrawHill, March 2019. 2. M.P. Bhav, S.A. Patekar, Programming with Java, Pearson, 2012.				
Suggested Reading 1. Barry Burd, Beginning Programming with Java for Dummies, 5th edition, Wiley, 2017.				
Web Resources 1. https://docs.oracle.com/javase/tutorial/java/nutsandbolts/index.html 2. https://www.javatpoint.com/java-tutorial 3. https://www.programiz.com/java-programming 4. https://www.w3schools.com/java				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	1	3	-	2	-	-	-	-	3	3	-	-	-	K1
CO 2	1	2	-	3	-	-	-	-	3	3	-	-	-	K2
CO 3	2	3	1	3	3	3	2	3	-	3	3	2	-	K3
CO 4	1	2	2	3	3	3	3	3	-	3	3	3	-	K4
CO 5	3	3	3	2	3	3	3	3	-	-	3	3	3	K5
Wt. Avg.	1.6	2.6	2	2.6	3	3	2.7	3	3	3	3	2.7	3	
Wt. Avg.	2.6								2.9					

Object Oriented Programming using Java Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	III		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) To understand different java execution methods) To create simple java program based on problems) To use the extended functionalities overloading and overriding.) To implement exception and event handling mechanism. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels
On completing the course successfully, the student will be able to			
CO 1	Recall the execution procedures and basic java expressions and statements.	PSO 1, PSO 2, PSO 5	K1
CO 2	Demonstrate programs using object oriented concepts.	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K2
CO 3	Experiment with strings, arrays, inheritance and package concepts.	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K3
CO 4	Categorize the implementation of overloading and overriding.	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K4
CO 5	Interpret programs to implement multithreading, exceptional handling and event handling.	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Execution of programs using Command prompt Programs to implement arrays concept. Simple programs to learn Control Structures.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Programs to perform String handling using Strings and String Buffer. Programs to perform overloading concept.	15	CO1 CO2 CO3 CO4	K1,K2,K3,K4, K5

			CO5	
III	Programs to implement Inheritance using super(). Programs to implement Overriding. Programs to understand abstract class.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Programs to create and import packages Programs to implement Multithreading Programs to build Interface	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Programs to implement Exceptional Handling Programs to perform CRUD operations using JDBC Programs using AWT classes and Controls.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Herbert Schildt, JAVA:The Complete Reference, 11th Edition, Tata McGraw Hill, 2019
2. Bruce, Eckel, Thinking in Java, 3rd edition, Pearson education, 2005.

References

1. Balagurusamy, Programming with Java, 6th Edition, McGrawHill, March 2019.
2. M.P. Bhavre, S.A. Patekar, Programming with Java, Pearson, 2012.

Suggested Reading

1. Barry Burd, Beginning Programming with Java for Dummies, 5th edition, Wiley, 2017.

Web Resources

1. <https://docs.oracle.com/javase/tutorial/java/nutsandbolts/index.html>
2. <https://www.javatpoint.com/java-tutorial>
3. <https://www.programiz.com/java-programming>
4. <https://www.w3schools.com/java>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	1	1	1	1	1	2	3	3	-	-	3	K1
CO 2	2	3	1	3	3	1	2	3	3	3	3	3	3	K2
CO 3	2	3	2	3	3	3	2	3	3	3	3	3	3	K3
CO 4	2	3	3	3	3	3	3	3	3	3	3	3	3	K4
CO 5	2	3	3	3	3	3	3	3	3	3	3	3	3	K5
Wt. Avg.	2	3	2	2.6	2.6	2.2	2.2	2.8	3	3	3	3	3	
Wt. Avg.	2.4								3.0					

Computer Integrated Statistical Methods and Optimization Technique - I

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	III		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	J To gain understanding about the basic concepts of Data Analysis and Statistical Computations. J To find numerical solutions to problems where the exact relationship between the variables were not known.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remembering the knowledge of Statistics, data collection, Presentation of data with diagrams and graphs.	PSO 1, PSO 2	K1
CO 2	Interpreting statistical data using measures of central tendency, dispersion	PSO 1, PSO 2	K2
CO 3	Apply the correlation and regression concepts	PSO 1, PSO 2, PSO 3	K3
CO 4	Solving Interpolation with equal & unequal intervals	PSO 1, PSO2, PSO 3, PSO 4	K4
CO 5	Evaluate numerical differentiation & integration using different methods.	PSO 1, PSO2, PSO 3, PSO 4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Diagrammatic and Graphical Presentation Of Data: Significance of diagrams and graphs; types of diagrams – types of bar diagrams – simple bar diagrams, multiple bar diagrams, sub-divided bar diagrams; graphs of frequency distributions - histogram, frequency polygon, cumulative frequency curves or ogives.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Measures of Central Value: Objectives of averaging, requisites of good average, types of averages – Arithmetic mean, Median, Mode. Measure of Dispersion: Methods of studying variation – Inter-quartile range or the quartile deviation, mean deviation, standard deviation.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Correlation Analysis: types of correlation; Karl Pearson's coefficient; properties of coefficient of correlation; rank correlation coefficient. Regression Analysis: Regression lines, regression equations.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	Interpolation: Introduction; Newton's Interpolation formulae; Lagrange's Interpolation formula; divided differences; Newton's divided difference formula	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Numerical Differentiation and Integration: Numerical integration – Trapezoidal rule, Simpson's one third rule; Simpson's three eight rule.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. S. P.Gupta, Statistical methods, Sultan Chand & Son, Thirty fourth edition, 2005 2. S. Arumugam, A.Thangapandi Isaac, A. Somasundaram, Numerical methods SCITECH publications Pvt ltd, Second edition 2005.				
References 1. V. K. Kapoor, Operations Research Techniques for management, Sultan Chand & Sons, Seventh revised edition, 2001. 2. Prem Kumar Gupta, D. S. Hira, Operations Research, S. Chand and co Ltd., First Edition, 1976 3. KantiSwarup, P.K Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Twelfth edition,2004.				
Suggested Reading 1. S.C.Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third Edition(2015), Sultan Chand& Sons, New Delhi. 2. Devi Prasad, Introduction to Numerical Analysis, Narosa Publishing House, 2003. 3. Gupta B.D., Numerical Analysis, New Delhi: Konark Publishers Pvt. Ltd, 2000.				
Web Resources 1. https://ocw.mit.edu/courses/sloan-school-of-management/15-075j-statisticalthinking-and-data-analysis-fall-2011/index.html 2. https://stattrek.com/ 3. https://numericalmethodstutorials.readthedocs.io/en/latest/				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	1		3	-	-	-	-	3	3	-	-	-	K1
CO 2	3	2	-	3	-	-	-	-	3	3	-	-	-	K2
CO 3	3	2	1	3	2	3	-	3	3	3	1	-	-	K3
CO 4	3	2	1	3	1	3	2	3	3	3	2	3	-	K4
CO 5	3	1	1	3	2	3	2	3	3	3	1	1	2	K5
Wt. Avg.	3	1.6	1	3	1.7	3	2	3	3	3	1.3	2	2	
Wt. Avg.	2.2								2.2					

Agile Project Management

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	III		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To understand the steps in project management) To explore the phases and working of agile Project management) To know about effective communication between team members) To identify the risks in project management and getting to know how to manage it) To calculate the cost, budgeting and quality assurance of a project.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Define the project management and its types	PSO 1	K1
CO 2	Explain the Agile project management technique	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K2
CO 3	Organize the phases of project management	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K3
CO 4	Survey the risk management techniques	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K4
CO 5	Choose a good project team. Communicate and understand as a team player.	PSO 1, PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	Cos	BLOOM'S TAXONOMY LEVEL
I	Introduction to Process Models - Business strategy and project selection - The Basics of Project and Project Management (PM) The nature of project management - How projects differ from line work - Project management definitions - Project management in a systems context - Project typologies - Project life cycle / Stages within a project.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,4, K5
II	The Basics of the Agile Project management - Modernizing Project Management: Introducing Agile Project Management - The Agile Manifesto and Principles - Changes as a Result of Agile - Changing Team Philosophy: Working in Agile	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,4, K5

III	Project design - Complexity - Activities and Outputs - Projects, Programs and Portfolios.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	The communication in project - Managing Team Dynamics and Communication - Choosing the Right Project Team Members	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Risks - The project organization / The influence of the management structure - Project execution -Control - Capital Costs and Budgeting - Costs and Estimates (Human Resources, Time-scale, Costs) - Cost Control - Quality Assurance - Change Control	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks <ol style="list-style-type: none"> 1. James Edge, Agile: An Essential Guide to Agile Project Management, The Kanban Process and Lean Thinking + A Comprehensive Guide to Scrum., 2018 2. Kenneth S. Rubin, PMP in Depth, 2nd Edition, 2009, ISBN: 159863996X. 				
References <ol style="list-style-type: none"> 1. Eric Ries The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, 2019. 2. Lyssa Adkins ,Coaching Agile Teams: A Companion for Scrum Masters, Agile Coaches, and Project Managers in Transition, 2019 3. Mark C. Layton ,Agile Project Management for Dummies 				
Suggested Reading <ol style="list-style-type: none"> 1. Agile Project Management: Learn How to Manage a Project with Agile Methods, Scrum, Kanban and Extreme Programming, Konnor Cluster, 2017 2. Pedro M. Santos, Marco Consolaro, Alessandro Di Gioia, Agile Technical Practices Distilled: A learning journey in technical practices and principles of software design, 2017. 				
Web Resources <ol style="list-style-type: none"> 1. http://www.utdallas.edu/library/resources/ebooks/ebooks.php 2. http://www.utdallas.edu/library/resources/ebooks/ebooks.php 3. https://www.linkedin.com/learning/agile-foundations 4. https://onlinecourses.nptel.ac.in/noc19_mg30/preview. 				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3		2	-	-	-	-	3		-	-	-	K1
CO 2	3	3	2	2	2	2	2	2	3	3	3	3	3	K2
CO 3	3	3	3	3	2	2	2	2	3	3	3	3	3	K3
CO 4	3	3	3	3	2	2	2	2	-	3	3	3	3	K4
CO 5	3	3	3	3	2	2	2	2	-	3	3	3	3	K5
Wt. Avg.	3	3	2.8	2.6	2	2	2	2	3	3	3	3	3	
Wt. Avg.	2.4								3.0					

E-Commerce Technologies

Course Code			
Credits	3		
Hours / Cycle	4		
Category	Part IV	Inter Disciplinary	Theory
Semester	III/IV		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) Understand Ecommerce Framework.) To provide knowledge on Ecommerce technology, Business Models and M-Commerce.) To explore the major issues associated with e-commerce-security, privacy, authentication, encryption and e-Payment. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Select the basic concepts and technologies used in the field of management information systems.	PSO 1, PSO 2	K1
CO 2	Outline the different types of management information systems.	PSO 1, PSO 2, PSO4	K2
CO 3	Identify the expertise in mobile commerce and apply knowledge to understand the development of E-Business portals	PSO 2, PSO 3, PSO 4	K3
CO 4	Inspect the impact of E-commerce on business models and strategy	PSO 1, PSO 2, PSO 4, PSO 5	K4
CO 5	Assess the key security threats in the E-commerce environment.	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOUR S	COs	BLOOM'S TAXONOMY LEVEL
I	History of E-commerce and Indian Business Context: E-Commerce –Emergence of the Internet – Emergence of the WWW –Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition Challenges for Indian Corporate. Business Models for E- commerce: Business Model – E-business Models Based on the Relationship of Transaction Parties -E-business Models Based on the Relationship of Transaction Types.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

II	Enabling Technologies of the World Wide Web: World Wide Web – Internet Client-Server Applications – Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. e-Marketing : Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	E-Security: Information system Security – Security on the Internet – E-business Risk Management Issues – Information Security Environment in India. Legal and Ethical Issues : Cyber stalking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	e-Payment Systems: Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e- payment Systems – Digital Signature – Online Financial Services in India - Online Stock Trading.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Information systems for Mobile Commerce: What is Mobile Commerce? – Wireless Applications – Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies – Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. Portals for E-Business: Portals – Human Resource Management – Various HRIS Modules.		CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

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

References

1. David Whiteley, “E-Commerce Strategy, Technologies and Applications”, Tata McGrawHill, 2001.
2. Ravi Kalakota, Andrew B Whinston, “Frontiers of Electronic Commerce”, Pearson 2006, 12th Impression.

Suggested Reading

1. Janice Reynolds, The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-Based Business, CRC Press 2004, 2nd Edition
2. Elias M. Awad, ELECTRONIC COMMERCE from Vision to Fulfillment, PHI 2004, 3rd edition.

Web Resources

1. https://www.tutorialspoint.com/e_commerce
2. <https://www.javatpoint.com/e-commerce>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	3	3	3	3	3	3	3	3	3	3	-	2		K2
CO 3	3	3	3	3	3	3	3	3	-	3	3	3	-	K3
CO 4	3	3	3	3	3	3	3	3	3	3	-	3	3	K4
CO 5	3	3	3	3	3	3	3	3	-	-	3	3	3	K5
Wt. Avg.	3	3	3	3	3	3	3	3	3	3	3	2.8	3	
Wt. Avg.	3.0								2.9					

SEMESTER IV**Python for Data Science**

Course Code			
Credits	5		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	IV		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) To understand the syntax and object oriented concepts of Python programming.) To analyze the different python data structures.) To understand the concepts of Data Science for solving business problems.) To employ the Python libraries for Data manipulation and visualization. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List and recall the syntax and flow of statements to develop programs.	PSO1, PSO2	K1
CO 2	Interpret the fundamental concepts of object oriented programming in python.	PSO 2, PSO 3, PSO 4, PSO 5	K2
CO 3	Develop python functions with core data structures like string, list, dictionaries and tuples.	PSO 2, PSO 3, PSO 4, PSO 5	K3
CO 4	Analyze the fundamentals of data science and to evaluate different data analysis techniques for handling large datasets.	PSO 1, PSO 2, PSO 3, PSO 4	K4
CO 5	Evaluate the usage of different python packages to work with data and visualize the solution.	PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	PYTHON FUNDAMENTALS - Statements – Expressions-Control statements-functions- Recursion. PYTHON CLASS - Class statement-Methods- Inheritance	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

II	PYTHON DATA TYPES - Strings: string operations and method - List:List operations and method – Dictionary: Dictionary operations and method - Tuple:Tuple operations and method- Set: Set operations and method	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	INTRODUCTION TO DATA SCIENCE Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models : Classification- Logistic Regression and Random Forest – presenting and building applications.	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	DATA ANALYSIS - Features of Numpy - Mathematical functions - Statistical functions - Arrays - Features of Pandas - series data structure – data frames - creation and manipulation of data frames	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	DATA VISUALIZATION - Matplotlib package - plotting graphs - legends - colors - labels – seaborn Package	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. Wes Mckinney, Python for data Analysis , O'Reilly,2017 2. Shai vaingast, Beginning Python on visualization, A Press 2014 3. David Cielen, Arno D. B. Meysman, and Mohamed Ali, Introducing Data Science , Manning Publications, 2016. 4. Joel grus, Data Science from Scratch , O'Reilly,2015				
References 1. Allen Downey, Jeffrey Elkner, Chris Meyers, How to Think Like a Computer Scientist - Learning with Python, Dreamtech Press 2. Mark Lutz, Learning Python Powerful Object Oriented Programming , O'reilly Media 2018, 5th Edition.				
Suggested Reading 1. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, O'reilly,First edition, 2016				
Web Resources 1. https://www.programiz.com/python-programming 2. https://www.learnpython.org/ 3. https://realpython.com/tutorials/data-science/				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	2	3	2	2	2	2	-	2	3	3	3	K2
CO 3	2	3	2	3	2	2	2	2	-	2	3	3	3	K3
CO 4	2	3	1	3	3	2	2	2	3	3	3	3	-	K4
CO 5	1	3	2	3	3	2	2	2	-	3	3	3	3	K5
Wt. Avg.	1.8	3	1.8	3	2.5	2	2	2	3	2.6	3	3	3	
Wt. Avg.	2.3								2.9					

Python Programming for Data Science - Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	IV		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To develop simple and object oriented python programs.) To write functions based on the usage of different data structures.) To create solutions for solving business problems.) To explore and visualize data using python packages		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Recall the basic python expressions and statements.	PSO1, PSO2	K1
CO 2	Programs to demonstrate the object oriented concepts.	PSO 2, PSO 3, PSO 4, PSO 5	K2
CO 3	Build python data structure and create functions for different problems.	PSO 2, PSO 3, PSO 4, PSO 5	K3
CO 4	Examine data analysis techniques for large dataset using python packages.	PSO 1, PSO 2, PSO 3, PSO 4	K4
CO 5	Evaluate visualization of data.	PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Simple programs to understand control structures. Programs to create user defined functions. Programs to implement OOPs concept.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Programs to implement string manipulations. Programs to create and perform list operations. Programs to create and manipulate dictionaries. Programs to create and perform tuple operations. Programs to create and perform set operations.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Program to read and display the dataset. Programs to analyse the dataset. Programs to explore and build a model.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	Programs to implement Numpy. Programs to implement Pandas.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5,
V	Programs to plot graph using Matplotlib. Programs to plot graph using Seaborn.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. Wes McKinney, Python for data Analysis , O'Reilly,2017. 2. Shai vaingast, Beginning Python on visualization, A Press 2014 3. David Cielien, Arno D. B. Meysman, and Mohamed Ali, Introducing Data Science , Manning Publications, 2016. 4. Joel grus, Data Science from Scratch , O'Reilly,2015				
References 1. Allen Downey, Jeffrey Elkner, Chris Meyers, How to Think Like a Computer Scientist - Learning with Python, Dreamtech Press, 2002 2. Mark Lutz, Learning Python Powerful Object Oriented Programming , O'reilly Media 2018, 5th Edition.				
Suggested Reading 1. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, O'reilly,First edition, 2016				
Web Resources 1. https://www.programiz.com/python-programming 2. https://www.learnpython.org/ 3. https://realpython.com/tutorials/data-science/				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	2	3	2	2	3	2	-	3	3	3	3	K2
CO 3	2	3	2	3	2	2	3	2	-	3	3	3	3	K3
CO 4	2	3	1	3	3	2	3	2	3	3	3	3	-	K4
CO 5	1	3	2	3	3	2	3	2	-	3	3	3	3	K5
Wt. Avg.	1.8	3	1.8	3	2.5	2	3	2	3	3	3	3	3	
Wt. Avg.	2.3								3					

Computer Integrated Statistical Methods and Optimization Technique – II

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	IV		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	To introduce Operations Research and its applications. To present methods of solving Linear Programming problems, Transportation, problems and Assignment problems. To introduce sequencing models To study different techniques of solving problems in network scheduling.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Understand the basic concepts of Operations Research and formulation of linear programming problems and solving using graphical method	PSO1, PSO2, PSO3	K1
CO 2	Explain linear programming problems by using simplex and two-phase simplex method	PSO1, PSO2, PSO3	K2
CO 3	Solve transportation problems using mathematical techniques	PSO1, PSO2, PSO3	K3
CO 4	Examine the solving method of Assignment problem and apply sequencing concepts to solve real time problems.	PSO1, PSO2, PSO3, PSO4	K4
CO 5	Explain the network of PERT and CPM	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction to Operations Research: Operations research defined; characteristics of OR; scope of OR; models and modeling in OR – advantages and drawbacks of OR models. Linear Programming – I : Linear programming defined; requirements of linear programming problem; general model of linear programming problem; formulating a problem as an linear programming model; graphic method of	18	CO1 CO2 CO3 CO4	K1, K2, K3, K4, K5

	solution; some special cases in linear programming.		CO5	
II	Linear Programming – II: Principle of simplex method – basic terms involved in simplex procedure; computational aspect of simplex method; special situations encountered during the application of simplex method – unbounded solutions; two-phase simplex method.	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Transportation Problem: General structure of transportation problem; linear programming formulation of the transportation problem; solution procedure for transportation problem; methods for finding initial solution – North West Corner method, Least Cost method, Vogel's Approximation method; test for optimality – stepping stone method	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Assignment Problem: Approach of the assignment model; maximization in an assignment problem; unbalanced assignment problem. Sequencing Problems: Basic terminology and notations; general assumptions; processing n-jobs through two machines, processing n-jobs through three machines.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Project Management: Basic concepts of network analysis, time estimates in critical path analysis; critical path method (CPM); programme evaluation and review technique (PERT); distinction between PERT and CPM.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Sankara Iyer, P. (2012) Operations Research. 5th ed. Tata McGraw Hill Education Private Limited

References

1. V. K. Kapoor, Operations Research Techniques for management, Sultan Chand & Sons, Seventh revised edition, 2001.
2. Prem Kumar Gupta, D. S. Hira, Operations Research, S. Chand and co Ltd., First Edition, 1976
3. KantiSwarup, P.K Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Twelfth edition, 2004.

Suggested Reading

1. Vittal P.R. and Malini, V. (2002) Operations Research. 1st ed. Margham Publications, Chennai.
2. Sharma S. D. (1996) Operations Research, 11th ed. Kedar Nath Ram Nath & Co., Meerut.

Web Resources

1. <http://www.pitt.edu/~jrclass/or/or-intro.html>
2. <http://home.ubalt.edu/ntsbarsh/econ/graphical.doc>

Course Articulation Matrix														
Course Outcome s	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	2	1	2	3	2	-	2	3	3	3	-	-	K1
CO 2	3	2	1	2	3	2	-	2	3	3	3	-	-	K2
CO 3	3	2	1	2	3	2	-	2	3	3	3	-	-	K3
CO 4	3	2	1	2	3	2	3	2	3	3	3	2	-	K4
CO 5	3	2	1	2	3	2	3	2	3	3	3	2	2	K5
Wt. Avg.	3	2	1	2	3	2	3	2	3	3	3	2	2	
Wt.Avg.	2.2								2.6					

Object Oriented Analysis and Design

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Allied	Theory
Semester	IV		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To understand the concepts of Object Oriented Modeling) To identify an Unified Process and relate Use cases) To create UML diagrams both static and dynamic) To create different design patterns) To create a test cases		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K6)
On completing the course successfully, the student will be able to			
CO 1	Define the principles of objectorientedModelling.	PSO1, PSO2	K1
CO 2	Interpret the Unified Process anduse case.	PSO2, PSO3	K2
CO 3	Develop Static and Dynamic UML	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Analyze the suitable design patterns as required	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	Select test cases and plans for software.	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Unified Process and use case Diagrams: Introduction to OOAD with OO Basics — Unified Process — UML diagrams — Use Case – Case study — the Next Gen POS system, Inception -Use case Modelling — Relating use case — include, extend and generalization — When to use Use-case	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

II	Static UML Diagrams: Class Diagram— Elaboration — Domain Model — Finding conceptual classes and description classes — Associations — Attributes — Domain model refinement — Finding conceptual class Hierarchies — Aggregation and Composition — Relationship between sequence diagrams and use cases — When to use Class Diagrams	20	CO1 CO2 CO3 CO4 CO5	K1,K2,K3, K4, K5
III	Dynamic and Implementation of UML diagrams: Dynamic Diagrams — UML interaction diagrams — System sequence diagram — Collaboration diagram — When to use Communication Diagrams — State machine diagram and Modelling –When to use State Diagrams — Activity diagram — When to use activity diagrams Implementation Diagrams — UML package diagram — When to use package diagrams — Component and Deployment Diagrams — When to use Component and Deployment diagrams	20	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Design Patterns: GRASP: Designing objects with responsibilities — Creator — Information expert — Low Coupling — High Cohesion — Controller Design Patterns — creational — factory method — structural — Bridge — Adapter — behavioural — Strategy — observer –Applying GoF design patterns — Mapping design to code	20	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Testing: Object Oriented Methodologies — Software Quality Assurance — Impact of object orientation on Testing — Develop Test Cases and Test Plans	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2015.
2. Ali Bahrami – Object Oriented Systems Development – McGraw Hill International Edition – 1999.

References

1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.
2. Martin Fowler, UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley, 2003

Suggested Reading

1. Simon Bennett, Steve Mc Robb and Ray Farmer, Object Oriented systems analysis and design Using UML 4th Edition, McGraw, Hill Education, 2010.

Web Resources

1. https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.htm
2. <https://www.javatpoint.com/uml-diagrams>
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_uml_structural_diagrams.htm

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	1	-	-	-	-	3	3	-	-	-	K1
CO 2	3	3	2	2	1	2	-	3	-	3	2	-	-	K2
CO 3	3	3	2	3	3	3	2	2	3	3	3	3	3	K3
CO 4	3	3	3	3	3	3	3	2	3	3	3	3	3	K4
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	K5
Wt. Avg.	2.8	3	2.5	2.4	2.5	2.8	2.6	2.5	3	3	2.8	3	3	
Wt. Avg.	2.6								2.9					

SEMESTER V**PHP and MySQL**

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	V		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To write programs using PHP.) To understand the concept of database.) To develop a webpage with database connectivity		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List and recall the basics of PHP.	PSO 1, PSO2	K1
CO 2	To understand the database concepts	PSO 1, PSO2, PSO3	K2
CO 3	To extract data from backend using MySQL queries	PSO 2, PSO3, PSO4, PSO5	K3
CO 4	To establish database connectivity	PSO 2, PSO3, PSO4, PSO5	K4
CO 5	Explain the creation of web applications using PHP and MySQL	PSO 2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: Introduction- open source- PHP – history- features- variables- statements- operators- conditional statements-if-switch-nesting conditions- while-do-for – loop iteration with break and continue.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Arrays and Functions: Arrays: Creating anarray, modifying array, processing array, creating user, defined functions, using files,	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

	sessions, cookies.			
III	DBMS: Database - System Applications, Purpose of Database Systems, View of Data, Database languages, Relational Databases, Data storage and Querying, Transaction Management, Database Architecture. Normalization – First, Second and Third Normal Forms.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Introduction to Relational Model: Structure of Relational Databases, Database Schema, keys, Schema diagrams, Relational Query Language Introduction to SQL: SQL Data definition, Basic Structure of SQL Queries, Additional Basic operations, Set operations, null values, Aggregate function, Nested Sub queries, Modification of the database.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	MySQL with PHP -database connectivity-usage of MYSQL commands in PHP, processing result sets of queries- handling errors-debugging and diagnostic functions-validating user input through Database layer and Application layer- formatting query output with Character, Numeric, Date and time.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books

1. VIKRAM VASWANI, PHP and MySQL , Tata McGraw-Hill, 2005
2. Abraham Silberchatz, Hank F. Korth, S. Sudarshan, Database System Concepts, Sixth edition, McGraw-Hill, 2011.

References

1. RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems , FifthEdition, Pearson Education, 2008.
2. Nilesh Shah, Database Systems using oracle – A Simplified guide to SQL and PL/SQL, second edition, PHI learning, 2013
3. Tim Converse, Joyce Park and Clark Morgan, PHP 5 and MySQL , Wiley India reprint,2008.
4. Robert Sheldon, Geoff Moes, Beginning MySQL , Wrox, 2005.

Suggested Reading

1. <https://freecomputerbooks.com/webPhpBooks.html>

Web Resources

1. <https://www.w3schools.com/php/>
2. <https://www.tutorialspoint.com/php/index.htm>
3. <https://www.phptutorial.net>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	3	3	3	2	-	3	3	3	2	-	-	K2
CO 3	1	3	3	3	3	2	2	1	-	3	1	1	1	K3
CO 4	1	2	2	2	2	2	2	2	-	3	2	1	3	K4
CO 5	2	3	2	3	3	3	3	3	-	3	3	3	3	K5
Wt. Avg.	1.6	2.8	2.5	2.8	2.7	2.3	2.3	2.3	3	3	2	1.6	2.3	
Wt. Avg.	2.4								2.4					

PHP and MySQL Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To write programs using PHP.) To understand the concept of databases.) To develop a web page with database connectivity		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	To define the basics of PHP	PSO1, PSO2	K1
CO 2	To understand the database concepts	PSO1, PSO2, PSO3	K2
CO 3	To extract data from backend using MySql queries	PSO2, PSO3, PSO4, PSO5	K3
CO 4	To establish database connectivity	PSO2, PSO3, PSO4, PSO5	K4
CO 5	To decide the creation of web applications using PHP and MySql	PSO 2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	1. Create a PHP program to find addition, subtraction and multiplication of two numbers. 2. Create a PHP program to reverse a number.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
II	3. Create a PHP program to find maximum and minimum value in an array. 4. Create a PHP program to implement session management	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
III	5. Performing table creation and modification, inserting, updating and deleting data in tables.	15	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5

IV	6.Create queries using aggregate functions and subqueries. 7.Create a query based on condition.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	8.Create a PHP program to calculate EB bill generation. 9. Create a PHP program to calculate employee payroll. 10. Create a PHP program to create a purchase order. 11. Create a PHP program to create a student marksheet. 12. Create a PHP program to calculate salesman commission.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. Vikram Vaswani, PHP and MySQL , Tata McGraw-Hill, 2005
2. Abraham Silberchatz, Hank F. Korth, S. Sudarshan, Database System Concepts, Sixth edition, McGraw-Hill, 2011.

References

1. RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems , FifthEdition, Pearson Education, 2008.
2. Nilesh Shah, Database Systems using oracle – A Simplified guide to SQL and PL/SQL, second edition, PHI learning, 2013
3. Tim Converse, Joyce Park and Clark Morgan, PHP 5 and MySQL , Wiley India reprint,2008.
4. Robert Sheldon, Geoff Moes, Beginning MySQL , Wrox, 2005.

Suggested Reading

1. <https://freecomputerbooks.com/webPhpBooks.html>

Web Resources

1. <https://www.w3schools.com/php/>
2. <https://www.tutorialspoint.com/php/index.htm>
3. <https://www.phptutorial.net>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	3	3	3	2	-	3	3	3	2	-	-	K2
CO 3	1	3	3	3	3	2	2	1	-	3	1	1	1	K3
CO 4	1	2	2	2	2	2	2	2	-	3	2	1	3	K4
CO 5	2	3	2	3	3	3	3	3	-	3	3	3	3	K5
Wt. Avg.	1.6	2.8	2.5	2.8	2.7	2.3	2.3	2.3	3	3	2	1.6	2.3	
Wt. Avg.	2.4								2.4					

Cloud Computing and Block Chain Management

Course Code			
Credits	4		
Hours / Cycle	4		
Category	Part III	Core	Theory
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives	<ul style="list-style-type: none">) To provide knowledge about the fundamentals and essentials of cloud computing.) To provide a strong foundation of Cloud Computing for using and adopting to cloud computing services and tools in the real life scenario) To explore cloud computing systems and Applications) To provide an exposure to frontier areas of cloud computing and information systems leading to further study and research. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Define and relate the fundamentals of cloud computing	PSO1, PSO2	K1
CO 2	Explain the working along with traditional computing	PSO2, PSO3, PSO4	K2
CO 3	Identify and list the applications of cloud computing	PSO1, PSO2, PSO3	K3
CO 4	Classify the services of cloud computing	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	Explain the working of Blockchain	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	CO's	BLOOM'S TAXONOMY LEVEL
I	Introduction: Cloud Computing Basics- Cloud Computing Overview, Disambiguation, Cloud Components, Infrastructure, Services. Application- Storage, Database Services. Intranets and the cloud-Components, Hypervisor Applications. Your Organization and Cloud Computing- When you can Use	12	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5

	Cloud Computing, Benefits, Limitations, Services			
II	The Business Case for Going to the Cloud: Cloud Computing Services, How those applications Help your Business, Deleting your Datacenter	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Cloud Computing Technology: Hardware and Infrastructure- Client, Security and Network, services, Accessing the Cloud- Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage Overview, Cloud storage providers.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Cloud computing at work: Software as a service-Overview, Driving Forces, Company Offerings. Developing Applications-Google, Microsoft, Intuit Quickbase. Local Clouds and Thin Clients: Virtualization in your Organization,	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Cloud Computing A practical Approach—Anthony T. Velte Toby J. Velte Robert Elsenpeter, 1st edition 2010 .
2. David S. Linthicum, Cloud Computing and SOA Convergence in Your Enterprise, Addison Wesley, 2009.
3. Getting Started with Enterprise Blockchain: A Guide to Design and Development

References

1. Cloud Computing for Science and Engineering (Ian Foster, et al)
2. Cloud Computing - Architecture and Applications (Jaydip Sena)
3. Blockchain for Dummies, 2nd IBM Limited Edition

Suggested Reading

1. https://www.tutorialspoint.com/cloud_computing/index.htm
2. <https://www.guru99.com/cloud-computing-for-beginners.html>
3. <https://blockchainhub.net/blockchains-and-distributed-ledger-technologies-in-general/>
4. <https://blog.todotnet.com/2019/03/solving-real-world-problems-with-distributed-ledger-technology/>

Web Resources

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs01/preview

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	1	-	-	-	-	3	1		-	-	K1
CO 2	3	3	3	2	2	2	2	2		2	2	2	-	K2
CO 3	3	3	3	3	3	2	2	-	2	3	1	-	-	K3
CO 4	3	3	3	3	3	2	2	2	2	3	3	3	3	K4
CO 5	3	3	3	3	3	2	2	2	2	3	3	3	3	K5
Wt. Avg.	3	3	3	2.4	2.6	2	2	2	2.3	2.4	2.2	2.7	3	
Wt. Avg.	2.5								2.5					

Operating Systems

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives	<ul style="list-style-type: none">) To understand and appreciate the working of operating system) To understand the problems in process communication and synchronization) To study the working of various CPU scheduling algorithms) To know about different memory management techniques) To compare and contrast the 2 different operating systems by case study 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	To define the role of the operating system as a high level interface to the hardware.	PSO1	K1
CO 2	To understand OS as a resource manager that supports multiprogramming	PSO1, PSO2, PSO3	K2
CO 3	To appraise the low level implementation of CPU scheduling.	PSO1, PSO2, PSO3	K3
CO 4	To compare and contrast the memory management techniques.	PSO1, PSO2, PSO3, PSO4	K4
CO 5	To identify the performance trade-offs inherent in OS implementation through case studies	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: operating system, history (1990s to 2000 and beyond), Process concepts: definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

II	Asynchronous concurrent processes: mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives , software solutions to the mutual Exclusion Problem-, hardware solution to the mutual exclusion- Semaphores Concurrent programming: monitors-condition variables. Deadlock and indefinite postponement: Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's, Banker's algorithm, deadlock detection, deadlock recovery.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Processor scheduling: scheduling levels, preemptive vs non-preemptive scheduling, scheduling objectives , scheduling criteria, scheduling algorithms -FIFO scheduling, RR scheduling, SPF scheduling , HRRN scheduling, SRT scheduling, multilevel feedback queues, Fair share scheduling.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Real memory organization and management : Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Virtual memory organization: virtual memory basic concepts, block mapping, paging Paging address translation by direct mapping, Segmentation-segmentation address translation by direct mapping, Segmentation/paging systems: Virtual memory management: page replacement strategies.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Unix/Linux Operating System Development Of Unix/Linux, Role & Function Of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, WileyIndian Edition (2010).
2. UNIX Concepts and Applications(4th Edition)– by Sumitabha Das, Tata McGraw Hill.

References

1. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
2. Operating Systems by D.M. Dhamdhare, Tata McGraw Hill 2nd edition.
3. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
4. Unix Shell Programming – by Yashwant Kanetkar, BPB publications.

Suggested Reading

1. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008)

Web Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs101/preview
2. <https://www.coursera.org/specializations/codio-introduction-operating-systems>
3. <https://www.udemy.com/course/operating-system-concepts/>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	1	-	-	-	-	3	-	-	-	-	K1
CO 2	3	3	3	2	2	2	-	2	3	3	3	-	-	K2
CO 3	3	3	3	3	3	2	-	2	3	3	3	-	-	K3
CO 4	3	3	3	3	3	2	2	2	3	3	3	3	-	K4
CO 5	3	3	3	3	3	2	2	2	3	3	3	3	3	K5
Wt. Avg.	3	3	3	2.4	2.8	2	2	2	3	3	3	3	3	
Wt. Avg.	2.5								3.0					

Internet of Things

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To introduce the basic concepts of IoT) To explain the architecture of IoT) To list and study the different domains of IoT) To understand the steps of IoT platform design) To correlate IoT with Web of things) To appraise the various e IoT applications		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	To list and recall the basic concepts of internet of things	PSO1, PSO2	K1
CO 2	To understand the different IoT domains and applications of IoT	PSO1, PSO2, PSO5	K2
CO 3	To utilize various devices in IoT	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	To analyze and work in an IoT platform	PSO1, PSO2, PSO3, PSO5	K4
CO 5	To plan and propose an IoT application	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction to IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Domain Specific IoTs; IoT and M2M: M2M, Difference between IoT and M2M, SDN and NFV for IoT; IoT System Management with NETCONF-YANG: Need for IoT Systems Management, Simple Network Management Protocol (SNMP)	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

III	IoT Platforms Design Methodology: IoT Design Methodology- Step 1: Purpose & Requirements Specification, Step 2: Process Specification, Step 3: Domain Model Specification, Step 4: Information Model Specification, Step 5: Service Specifications, Step 6: IoT Level Specification, Step 7: Functional View Specification, Step 8: Operational View Specification, Step 9: Device Or Component Integration, Step 10: Application Development.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web– Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Vijay Madiseti and ArshdeepBahga, Internet of Things: (A Hands-on Approach) , Universities Press (INDIA) Private Limited 2014, 1st Edition.
2. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective , CRC Press,2012
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things , Springer, 2011.

References

1. Michael Miller, The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World , Pearson Education 2015.
2. Francis da Costa, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything , Apress Publications 2013, 1st Edition.

Suggested Reading

1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice , Wiley 2014.
2. CunoPfister, Getting Started with the Internet of Things , O'Reilly Media 2011.
3. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a HighlyConnected World , Cambridge University Press, 2010.

4. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things – Key applications and Protocols , Wiley, 2012.

Web Resources

1. <https://github.com/connectIOT/iottoolkit>
2. <https://www.javatpoint.com/iot-internet-of-things>
3. https://www.tutorialspoint.com/internet_of_things/index.htm
4. https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	2	-	-	-	K1
CO 2	2	3	1	3	2	3	3	2	3	2	-	-	1	K2
CO 3	2	3	1	3	2	3	3	3	3	3	3	3	3	K3
CO 4	2	3	2	3	2	3	3	3	3	3	2	-	1	K4
CO 5	2	3	2	3	2	3	3	3	3	3	3	3	3	K5
Wt. Avg.	2	3	1.5	3	2	3	3	2.7	3	2.6	2.6	3	2	
Wt. Avg.	2.5								2.5					

Front End Development

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To understand the concept of a web page.) To understand the front end design.) To develop a front end webpage.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Understand the creation of web page	PSO1, PSO2	K1
CO 2	Applying style sheet in web page.	PSO1, PSO2, PSO3	K2
CO 3	Use images in web page.	PSO1, PSO2, PSO3	K3
CO 4	Concept of input control elements.	PSO4, PSO5	K4
CO 5	Knowledge on Bootstrap.	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: HTML5, Doctypes, hyperlinks. Lists, tables and comments. Using HTML with CSS: External style sheet use, internal style sheet, inline style. Classes and IDs: Giving an element a class, giving an element an ID, acceptable values.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Images: Creating an image, choosing alt text, responsive image using srcset attribute and picture element. Image maps: introduction to image maps. Tab index: adding and removing tab order.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Bootstrap: Introduction, Bootstrap file Structure, Global style. Default Grid System: Basic Grid HTML, Offsetting Columns. Nested Columns, FluidGrid System, Responsive Design.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

IV	Bootstrap: Introduction, Bootstrap file Structure, Global style. Default Grid System: Basic Grid HTML, Offsetting Columns. Nested Columns, Fluid Grid System, Responsive Design.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Layout Components: Drop Down Menus, Button Groups, Button with drop downs, Split Button dropdowns, Dropup menus. Navigation Elements: Tabular Navigation, Basic Pills Navigation, Stackable Navigation, Drop Downs, Navigation list.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. HTML5 Notes for Professionals by goalkicker.com, 2018
2. Jake Spurlock, Boot Strap, O'Reilly, 2013.

References

1. Head first HTML5 programming, Eric Freeman and Elisabeth Robson, 2011, O'Reilly media.
2. HTML5 and CSS3 All-in-one for Dummies, Andy Harris, 2014, Wiley Publication
3. Web Programming with HTML5, CSS and JavaScript, 2019.
4. Benjamin Jakobs, Mastering Bootstrap4, Packt Publishing, 2016.

Suggested Reading

1. Herbert Schildt, HTML & CSS: The Complete Reference, Fifth Edition
2. Fabio Cimo, Bootstrap Cook Book, 2015

Web Resources

1. <https://www.tutorialspoint.com/html5/index.htm>
2. <https://www.javatpoint.com/html5-tutorial>
3. Bootstrap - <https://www.w3schools.com/bootstrap/>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	2	3	2	3	-	2	3	3	2	-	-	K2
CO 3	1	3	1	3	2	3	-	2	3	3	2	-	-	K3
CO 4	2	3	1	3	2	3	3	2	-	-	-	3	3	K4
CO 5	2	3	2	3	2	3	3	2	-	-	2	3	3	K5
Wt. Avg.	1.8	3	1.5	3	2	3	3	2	3	3	2	3	3	
Wt.Avg.	2.4								2.8					

Advanced Databases Concepts

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	V		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To understand the concepts distributed system.) To understand the difference between traditional and modern databases.) To analyze the advantages of a modern databases.) To understand the architecture of modern databases.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List the advantages of distributed environment.	PSO1, PSO2	K1
CO 2	Compare and contrast traditional and modern database	PSO1, PSO2	K2
CO 3	Identify the features of modern databases.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Analyze the architecture of modern database.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	Explain the methods to create modern database.	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication,	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

	Combining Sharding and Replication.			
III	NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	NoSQL Key/Value databases using Riak, Key-Value Databases,Key-Value Store, Key- Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

References

1. Shashank Tiwari, Professional NoSQL, Wiley, 2011.
2. Adam Fowler, NoSQL for Dummies, Wiley, 2015.

Suggested Reading

1. Dan Sullivan, NoSQL for Mear Mortals, Pearson, 2015
2. Dan McCreary and Ann Kelly, Making sense of NoSQL, Dream Tech Press, 2013

Web Resources

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-databa>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	2	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	-	3	-	-	-	-	3	3	-	-	-	K2
CO 3	2	3	1	3	2	2	1	1	3	3	2	3	3	K3
CO 4	2	3	2	3	3	2	1	1	3	1	2	3	3	K4
CO 5	2	3	2	3	3	2	2	2	3	3	3	3	3	K5
Wt. Avg.	2.2	3	1.6	2.8	2.6	2	1.3	1.3	3	2.6	2.3	3	3	
Wt.Avg.	1.8								2.7					

Web Design

Course Code			
Credits	3		
Hours / Cycle	4		
Category	Part IV	General Elective	Theory
Semester	V		
Year of Implementation	From the academic year 2023-24 onwards		
Course Objectives) To understand the concept of web page.) To understand the front end design,) To develop a front end webpage.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Know how to create web page	PSO1, PSO2	K1
CO 2	Illustrate style sheet in web page.	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO 3	Apply image in web pages.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Design a web page using frames and forms.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	Explain the concepts of Java Script	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction to HTML: History to HTML, HTML generations, HTML documents, anchor tag, hyper links, Head & Body section: Header section, title, Colorful webpages, comment lines.	10	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5
II	Designing the body section: heading printing, aligning the heading, horizontal rule, paragraph, tab settings, images & pictures. Order & unordered list: Lists, Unordered list, headings in a list, ordered list, nested list.	13	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5

III	Table Handling: Tables, Table creation in HTML, width of the tables& cells, Cell spanning multiple rows/columns, coloring cells, column specification. Style sheets: Defining styles, elements of styles, linking the style sheet, in-line style, External style sheets, internal style sheets, and multiple styles.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Frames: Frameset definition, Frame definition, Nested framesets, A web pagedesign project: Forms: Action attribute, Method attribute, Enctype attribute, drop down list, sample forms.	13	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Introduction to Java Script: Displaying a line of text in a web page-data types. Simple web page using Java Script.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1.Pankaj Sharma, Web Technology, SK Kataria & Sons, 2011. 2.Mike Mcgrath, Java Script, Dream Tech Press 2006, First Edition.

References

1. Laura Lemay, Rafe Colburn , Jennifer Kyrnin, Mastering HTML, CSS & Javascript Web Publishing , 2016.
- 2.DT Editorial Services (Author), HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML,AJAX, PHP, jQuery) , Paperback 2016, 2nd Edition.
- 3.Wendy Willard, A Beginners Guide HTML , Tata McGraw Hill 2009, 4th Edition

Suggested Reading

1. C. Xavier, World Wide Web Design with HTML , TMH Publishers 2017.

WebResources

- 1.<https://www.w3schools.com/html/>
- 2.<https://www.geeksforgeeks.org/html/>
- 3.<https://www.tutorialspoint.com/html/index.htm>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	-	3	2	3	3	2	3	3	2	3	3	K2
CO 3	1	3	1	3	2	3	3	2	3	3	2	3	3	K3
CO 4	-	3	1	3	2	3	3	2	3	3	2	3	3	K4
CO 5	-	3	2	3	2	3	3	2	3	3	2	3	3	K5
Wt. Avg.	1.6	3	1.3	3	2	3	3	2	3	3	2	3	3	
Wt. Avg.	2.3								3					

System Administration and DevOps

Course Code			
Credits	3		
Hours / Cycle	2		
Category	Part IV	Skill based Training	Practical
Semester	V		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) Imparts knowledge on the components of hardware) Understand the installation process of operating systems) Perform network configuration and partitioning) Establish secured networks and setting up user accounts.) Gain knowledge in DevOps for enterprises and enable shared networks. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	To understand the components of Hardware and perform assembling	PSO1, PSO2	K1
CO 2	To understand the installation process and perform installation	PSO1, PSO2, PSO3	K2
CO 3	To gain knowledge in partitioning and IP addressing.	PSO1, PSO2, PSO3	K3
CO 4	To impart knowledge in system administration for enterprises, setting up user accounts and enable file sharing	PSO3, PSO4	K4
CO 5	To configure and set up secured networks	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: Hardware : PC-Memory - Rom BIOS, Types of RAM- SDRAM, DDR RAM - Cache Memory - Hard disk Drive-Jumper setting-Intel Series Mother Boards, Computer-server-client, cables, connectors, NIC-Network Interface Card, and Networking Devices. BIOS	6	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4 K5

	Setup, SMPS- AT & ATX Power supply- Keyboard, Mouse, Monitor, Printers, Ethernet Cards - PC Assembling and Disassembling			
II	Installation: Install and Uninstall MS Office, Flash, SQL Server, UBUNTU OS, Windows 11 operating System, Windows server 2008	6	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	System Maintenance: Creating Partitions, System Tools - Disk clean-up, System information, Disk defragmented and System Restore IP Addressing.	6	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Network Configuration in Ubuntu: Configuring Network, setting up user accounts, setting rights and policies, tools for setting Linux- SCP(Secure Copy),SSH (Secure Shell)	6	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Introduction to DevOps: History, Objectives, Devops and Software Development Life cycle, Continuous Integration & Deployment, Jenkins, Containers, Docker, Vagrant, Configuration management Tools, Ansible, Puppet, Chef.	6	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. Ubuntu unleashed, 2012 edition , Publisher: SAMS Publishing
2. Microsoft Windows Server 2008: The Complete Reference is a one-stop-shop for learning allThe essential steps for setting up Windows Server 2008.
3. IBM PC and Clones Hardware, Troubleshooting and maintenance-Second Edition.

References

1. Craig Zacker,PC Hardware: The Complete Reference Book ,McGraw Hill.
2. Evi Nemeth,UNIX and Linux System Administration Handbook Paperback,2017.
3. Wale Soyinka,Linux Administration: A Beginner's Guide, Eighth Edition (NETWORKING& COMMOMG) 2020

Suggested Reading

1. Gerardus Blokdy,Computer network Administration A Clear and Concise Reference
2. Thomas Limoncelli ,Practice of System and Network Administration, The: Volume 1: DevOps and other Best Practices for Enterprise IT, 2017.

Web Resources

- 1.<https://handoutset.com/wp-content/uploads/2022/05/The-Practice-of-System-and-Network-Administration-Second-Edition-Thomas-A.-Limoncelli-Christina-J.-Hogan-etc..pdf>
- 2.<https://ptgmedia.pearsoncmg.com/images/9780321492661/samplepages/0321492668.pdf>
- 3.<https://docs.oracle.com/cd/E19457-01/801-6632/801-6632.pdf>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	2	3	2	3	-	2	3	2	1	-	-	K2
CO 3	-	3	-	3	2	3	-	2	3	2	1	-	-	K3
CO 4	2	3	2	3	2	3	3	2	-	-	3	1	-	K4
CO 5	2	3	2	3	2	3	3	2	-	-	3	2	1	K5
Wt. Avg.	2	3	2	3	2	3	3	2	3	2.3	2	1.5	1	
Wt. Avg.	2.5								1.9					

SEMESTER VI**Programming .Net using C#**

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) Understand the basic object oriented concepts) Study the various controls and style sheets to design the applications.) Identify and create reports based on the requirement) Gain knowledge on SQL 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List and recall the basic programing concepts in C# language	PSO 1, PSO 2	K1
CO 2	Illustrate user interactive web pages using ASP.Net.	PSO 1, PSO 2, PSO 3	K2
CO 3	Apply style sheet for interactive forms and implement them in the C# programming language to design Windows Applications.	PSO 1, PSO 2, PSO 3	K3
CO 4	Examine Validations for the web applications	PSO 3, PSO 4, PSO 5	K4
CO 5	Determine and Store data for the various real time applications	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction to .NET frameworks, C# Program-The development Environment-Console Application, Variables and expressions, flow control : Boolean logic-The goto statement- Branching- Looping.Functions: Defining and using functions- Variable scope-The Main() Function. OOPs with C#, Object-Life cycle of an object-static and instance class members Defining classes and class members.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

II	Collections, Comparisons and Conversions, Delegates and Events, Windows programming: Controls(Button, Label, Link Label, Radio Button, Check Box, Text Box, Rich Text Box, List Box, Checked List Box, List View).	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Introduction to ASP.NET 4: Microsoft.NET framework, ASP.NET lifecycle. Themes in ASP.NET CSS: Need of CSS, Introduction to CSS, Working with CSS with visual developer ASP.NET server controls: Types of control, ASP.NET state management engine. Web.config and global.asax files.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Object Orientation basics Navigation: Understanding absolute and relative URLs- Using the Navigation Controls-Programmatic redirection. Validating User Input: Gathering data from the user, processing data at the server -User Controls: Introduction to user controls -Validating User input:Gathering data from the user- Processing data at the server.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Databases: Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Textbooks

1. K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner, Wrox, "Beginning Visual C# 2010", Wiley 2010.
2. I. Spanjaars," Beginning ASP.NET 4 in C# and VB", Reprint 2011.

References

1. Evjen, Hanselman, Rader ,Profesional ASP.NET 2.0 , John Wiley & Sons,2005
2. J. Kanjilal " ASP.NET 4.0 programming", Tata McGraw-Hill

Suggested Reading

1. Andrew Troelsen ,"Pro C# with .NET 3.0" , Apress, 2007, ISBN 978-1-59059-823-8
2. D. Esposito ,"Programming ASP.NET", Microsoft Press (Dreamtech), Reprint 2011.

Web Resources

1. <https://learn.microsoft.com/en-us/visualstudio/get-started/csharp/tutorial-aspnet-core?view=vs-2022>
2. <https://www.webtrainingroom.com/aspnet>
3. <https://www.ankitweblogic.com/asp/>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	1	3	-	2	-	-	-	-	3	3	-	-	-	K1
CO 2	1	2	2	3	3	3	-	2	3	3	3	-	-	K2
CO 3	2	3	1	3	3	3	-	3	3	3	3	-	-	K3
CO 4	1	2	2	3	3	3	3	3	-	-	3	3	3	K4
CO 5	3	3	3	2	3	3	3	3	-	-	3	3	3	K5
Wt. Avg.	1.6	2.6	2	2.6	3	3	3	2.8	3	3	3	3	3	
Wt. Avg.	2.5								3.0					

Programming .Net using C# Lab

Course Code			
Credits	3		
Hours / Cycle	5		
Category	Part III	Core	Practical
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) Understand the basic object oriented concepts) Study the various controls and style sheets to design the applications.) Identify and create reports based on the requirement) Gain knowledge on SQL 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remembering the basic C#Controlstatements	PSO 1, PSO 2	K1
CO 2	Demonstrate programs using object orientedconcepts.	PSO 1, PSO 2, PSO 3	K2
CO 3	Apply ASP.net Controls and style sheet forthe application	PSO 1, PSO 2, PSO 3	K3
CO 4	Analyze applications using query languages	PSO 3, PSO 4, PSO 5	K4
CO 5	Interpret reports using data	PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Simple programs to understand control structures. Programs to create user defined functions. Programs to implement OOPs concept.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Programs using Text Box and Button Programs using radio button Programs using List box, drop down	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Program to perform using style sheet	15	CO1 CO2 CO3	K1,K2,K3,K4,

			CO4 CO5	K5
IV	Programs to implement navigation controls. Programs to implement Validation controls.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Programs to connect to database. Generate Crystal Report	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner, Wrox , “Beginning Visual C# 2010”, (Wiley)2010. 2. I. Spanjaars,” Beginning ASP.NET 4 in C# and VB”, Reprint 2011.				
References 1. Evjen, Hanselman, Rader (2005) Profesional ASP.NET 2.0 , John Wiley & Sons 2. J. Kanjilal “ ASP.NET 4.0 programming”, Tata McGraw-Hill				
Suggested Reading 1. Andrew Troelsen ,”Pro C# with .NET 3.0” , Apress, 2007, ISBN 978-1-59059-823-8 2. D. Esposito ,”Programming ASP.NET”, Microsoft Press (Dreamtech), Reprint 2011.				
Web Resources 1. https://learn.microsoft.com/en-us/visualstudio/get-started/csharp/tutorial-aspnet-core?view=vs-2022 2. https://www.webtrainingroom.com/aspnet 3. https://www.ankitweblogic.com/asp/				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	2	-	-	-		3	3	-	-	-	K1
CO 2	3	3	3	3	3	3	-	3	3	3	2	-	-	K2
CO 3	2	3	3	3	3	3	-	3	2	3	3	-	-	K3
CO 4	2	3	3	3	3	2	2	3	-	-	3	3	3	K4
CO 5	1	2	3	3	3	3	2	3	-	-	3	3	3	K5
Wt. Avg.	2.2	2.8	3	2.8	3	2.6	2	3	2.6	3	2.8	3	3	
Wt. Avg.	2.7								2.8					

Data Communications and Networking

Course Code			
Credits	4		
Hours / Cycle	4		
Category	Part III	Core	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<p>) To understand the basics of Data Communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.</p> <p>) To gain knowledge on the various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.</p> <p>) To recognize the different internet devices and their functions.</p> <p>) To safe-guard the individual, society, organization and the government from the dangers of cyber frauds, scams, threats and attacks.</p>		

CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List and recall the basics of Data Communications and layered architecture	PSO1, PSO2	K1
CO 2	To understand the signals and its processing	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO 3	To apply the services provided by Networks	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	To examine the techniques for constructing the interconnecting devices in Networks	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	To analyze and choose a secured network for enabling connectivity	PSO1, PSO2, PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: Data communication – components; networks – network criteria, applications; protocols and standards – protocols, standards. Basic Concepts: Line configuration – point to point, multipoint; Topology – mesh, star, tree, bus, ring, hybrid technologies; transmission mode –	14	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

	simplex, half-duplex and full-duplex; categories of networks – LAN, MAN, WAN. The OSI Model: Model – Layered architecture; functions of the layers – physical layer, data link layer, network layer, transport layer, session layer, presentation layer, application layer.			
II	Signals: Analog and digital – Analog and digital data, analog and digital signals; periodic and aperiodic signals; Transmission Media: Guided media – twisted pair cable, coaxial cable, optical fiber; unguided media – radio frequency allocation, propagation of radio waves, satellite communication and cellular telephony.	14	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4 K5
III	Network layer: Services-Packet switching- Network layer performance- IPv4 Address-Internet Protocol	10	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Networking and Internetworking devices: Repeaters; Bridges; Routers; Gateways; Routing algorithms. – Distance vector Routing; Link State Routing.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4 K5
V	Security: Network layer security-Transport layer- Application Layer Security- Firewalls.	10	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. Behrouz, A. Forouzan, Data Communications and Networking, Fifth Edition, Tata McGraw-Hill publishing company Ltd 2013.
2. William Stallings, Data and Computer Communications, Tenth Edition, 2017.

References

1. Andrew. S. Tannenbaum, Computer Networks, Sixth edition, Prentice Hall of India Private Ltd, 2022
2. Achyut S. Godbole, Data Communications & Networks, Tata McGraw-Hill publishing, 2017.
3. Peter Norton's Complete Guide To Networking (The Norton Series)

Suggested Reading

1. NPTEL website of IIT Kharagpur of course- Communication Networks and Switching.
2. Data communication and networks –James Irvine and David Harley- Publishers: Wiley India.

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	2	-	-	-	-	3	3	-	-	-	K1
CO 2	2	3	2	2	1	1	2	1	3	3	1	1	1	K2
CO 3	2	3	1	3	3	2	2	3	3	3	2	3	3	K3
CO 4	2	3	2	3	3	2	2	3	3	3	3	3	3	K4
CO 5	2	3	2	3	3	2	2	3	3	3	3	3	3	K5
Wt. Avg.	2	3	1.8	2.6	2.5	1.7	2	2.5	3	3	2.3	2.5	2.5	
Wt. Avg.	2.2								2.6					

Department of Computer Applications (BCA)

Software Engineering

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Core	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">)] Imparts the idea of decomposing the given problem into Analysis, Designing, Implementation, Testing and Maintenance phases.])] Understand various process models in the software industry according to given circumstances and manage requirement modelling.])] Study fundamental concepts in software testing])] Understand various software testing issues and solutions in software unit test, integration and system testing.])] Gain knowledge in advanced software testing topics, such as White Box, Black Box testing methods.] 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remember the basics of Software Engineering and process models.	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO 2	To understand Agile concepts and methods.	PSO1, PSO3, POS4	K2
CO 3	To apply Requirement modelling techniques.	PSO3, PSO4, PSO 5	K3
CO 4	To examine Black box testing based on the scenario	PSO3, PSO4, PSO 5	K4
CO 5	To evaluate test cases using White box testing for the input methods	PSO3, PSO4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Introduction: Software and software Engineering, The nature of software. Engineering software process-software engineering practice software myths-Process Models: Generic process models-prescriptive process models-specialized process models-unified process	18	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Agile Development: Agile process– Extreme programming–Agile process models.	12	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

III	Requirement modelling: Requirement Analysis-Scenario based modelling Data modelling concepts-Class based modelling-Flow oriented modelling patterns for requirement modelling	16	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Black box testing techniques: Boundary Value Analysis, Equivalence class testing, state table based testing, decision table based testing.	14	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	White box testing techniques: Need, logic coverage criteria, basis path testing, Applications of path testing. Validation activities: Integration testing, function testing, System testing and acceptance testing.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. S. Pressman, Software Engineering: A Practioner's approach, seventh edition, Tata McGraw- Hill. 2009.
2. Naresh Chauhan, Software testing principles and practices, Oxford university Press.

References

1. R. Fairley, Software Engineering Concepts, Tata McGraw-Hill. 2001
2. Ian Sommerville, Software Engineering, Tenth Edition, Pearson 2017.
3. Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing – Principles and practices, fourteenth edition, Pearson, 2012.

Suggested Reading

1. John Ousterhout, A philosophy of Software Design
2. James Whittaker, Exploratory Software Testing: Tips, Tricks, Tours, and Techniques to Guide Test Design.

Web Resources 1.<https://www.techtarget.com/whatis/definition/softwareengineering>.
2.<https://www.javatpoint.com/software-engineering>
3.<https://www.coursera.org/articles/software-engineering>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	2	3	2	3	3	-	3	3	1	1	2	K1
CO 2	2	3	2	3	2	3	3	-	3	-	1	1	-	K2
CO 3	3	3	2	3	2	3	3	3	-	-	3	3	3	K3
CO 4	2	3	2	3	2	3	3	1	-	-	3	3	3	K4
CO 5	2	3	2	3	2	3	3	1	-	-	3	3	3	K5
Wt. Avg.	2.4	3	2	3	2	3	3	1.6	3	3	2.2	2.2	2.7	
Wt. Avg.	2.5								2.6					

Android and its Applications

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To understand the basic architecture and applications of android system.) To create GUI Application in Android platform.) To apply various styles, events and layouts in android.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remembering the architecture and advanced features of android technology.	PSO 1, PSO 2	K1
CO 2	Create fragments and activities after selecting the problem	PSO 1, PSO 2, PSO 3	K2
CO 3	Classify different layouts to create flexible User Interface	PSO 1, PSO 2, PSO 3, PSO 4	K3
CO 4	Build and utilize the media controls, Dialogs for the development of Android Application.	PSO 1, PSO 2, PSO 3, PSO 5	K4
CO 5	Assess the real time need and design the Android App.	PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	Android: An open platform for mobile development-Android SDK features, introducing the development framework, understanding Android software stack, Android Application architecture, Creating Android virtual devices. Types of Android Applications, Developing for Android, Android Activity Life Cycle, Role of the Android manifest file.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Creating the user interface, Commonly used Layouts and controls, Event handling, displaying message through toast, creating and starting an activity. Using the Edit Text control, Checkbox, Radio buttons.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

III	Laying out Controls in containers: Linear Layout, Relative Layout, Absolute Layout, Frame Layout, Table Layout, Grid Layout	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
IV	Adapting to screen orientation, Utilizing Resources: types, values, dimension and color, applying styles and themes, Arrays, playing audio and video, displaying progress with progress bar.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Displaying and fetching information using dialogs and fragments: What are dialogs? - selecting the date and time in one application. Fragments: The structure of a fragment, the life cycle of a fragment.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Text Books

1. B.M. Harwani, Android Programming Unleashed, First Edition, Pearson publications, 2013.
2. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt. Ltd., 2015.

References

1. Wallace Jackson, "Android Apps for Absolute Beginners", Apress, 2011.
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Barry Burd, "Android Application Development All in one for Dummies", Edition: I

Suggested Reading

1. Pradeep Kothari, "Android Application Development (with Kit Kat Support) Black Book", Dreamtech Press, 2018.
2. Dawn Griffiths, David Griffiths, "Head First Android Development A Brain - Friendly Guide", O'Reilly Media, 2015.
3. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox), 2013
4. Zigurd Mednieks, Laird Dornin, G. Blake Meike, and Masumi Nakamura, "Programming Android", O'Reilly

Web Resources

1. <http://developer.android.com/>
2. <https://www.tutorialspoint.com/android/index.htm>
3. https://www.tutorialspoint.com/mobile_development_tutorials.htm

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	-	3	-	-	-	-	3	3	-	-	-	K1
CO 2	3	3	3	3	2	1	-	3	3	3	2	-	-	K2
CO 3	3	3	3	3	3	2	2	3	3	3	2	3	-	K3
CO 4	2	2	2	2	2	2	2	2	3	3	3	-	3	K4
CO 5	3	2	3	2	3	3	3	3	-	3	3	2	3	K5
Wt. Avg.	2.8	2.6	2.8	2.6	2.5	2	2.3	2.8	3	3	2.5	2.5	3	
Wt. Avg.	2.6								2.8					

Department of Computer Applications (BCA)

Cyber Security

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) Impart fundamental knowledge in Cyber Security due to dependency on online operations, social media practices, upcoming technologies, digitization and pervasive nature of mobile devices in this digital era.) Gain knowledge in secure online operations and safe handling of devices which is the need of the hour.) Understand the security challenges as well as the best practices that are essential to protect one from becoming the victims of cybercrimes.) Safe-guard the individual, society, organization and the government from the dangers of cyber frauds, scams, threats and attacks. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	List the basics of Cyber Security	PSO1, PSO2	K1
CO 2	Understand the user authentication methods	PSO1, PSO2	K2
CO 3	Develop secured networks	PSO2, PSO3, PSO5	K3
CO 4	Analyze techniques for Cryptography	PSO3, PSO4	K4
CO 5	Assess case study on Cyber crime	PSO3, PSO4, PSO5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	Cos	BLOOM'S TAXONOMY LEVEL
I	Introduction: Basics and need of Cyber Security. Threats: Cyber Attack- Classification of Cyber Attacks - Classification of Malware, threats. Vulnerability assessment - Intrusion Detection systems - Intrusion Prevention Systems.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	User authentication methods: Introduction, Access Control, User Identification & Authentication. Meaning, Nature of Biometric identification/ Authentication techniques, Biometric techniques. Key Success factors and benefits.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Network Security: Need, Basic concepts, network security dimensions, establishing security perimeter for network protection, Network types. Firewall: Introduction, need,	15	CO1 CO2 CO3	K1,K2,K3,K4, K5

	topologies for different type of firewalls.		CO4 CO5	
IV	Cryptography: Basic elements of cryptography, Digital Signature, Cryptography algorithms – IES, AES and public key cryptography (RSA)	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Cyber Crimes: Types of Cyber Crimes, Scams and frauds. Digital Forensics: Challenges- Branches of Digital forensics- Investigation methods –Case study.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

Prescribed Books/Textbooks

1. Heimdal , Cyber Security for beginners ebook.pdf
2. Atul Kahate, Cryptography & Network Security, Tata Mcgraw 2006.

References

1. Jeremy Swinfen, Cyber Security: An introduction for non technical managers, 1st Edition, 2020.
2. Scott, The Secret to Cybersecurity: A Simple Plan to Protect Your Family and Business from Cybercrime, 2019.

Suggested Reading

Raef Meeuwisse, Cybersecurity For Beginners-, Lulu Publishing Services 2015
Applied Cryptography: Protocols, Algorithms, and Source Code in C, Wiley .

Web Resources

1. https://www.prms.com/media/2481/cybersecurity_booklet.pdf
2. https://www.ftc.gov/system/files/attachments/cybersecuritysmallbusiness/cybersecurity_sb_factsheets_all.pdf
3. <https://www.niti.gov.in/sites/default/files/2019/CyberSecurityConclaveAtVigyanBhavanDelhi>

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	2	-	-	-	-	3	2	-	-	-	K1
CO 2	2	3	-	2	-	-	-	-	3	2	-	-	-	K2
CO 3	2	3	1	3	3	1	3	2	-	3	2	-	2	K3
CO 4	2	3	1	3	2	1	3	2	-	-	3	2	-	K4
CO 5	2	3	1	3	2	1	3	3	-	-	2	3	3	K5
Wt. Avg.	2	3	1	2.6	2.3	1	3	2.3	3	2.3	2.3	2.5	2.5	
Wt. Avg.	2.1								2.5					

Department of Computer Applications (BCA)

Artificial Intelligence

Course Code			
Credits	4		
Hours / Cycle	5		
Category	Part III	Elective	Theory
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives	<ul style="list-style-type: none">) To improve knowledge representation and problem solving skills.) To enable continuous learning and social intelligence) To simplify critical jobs easier using problem solving ability.) To promote creativity and artificial thinking that can accomplish tasks better. 		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels (K1 to K5)
On completing the course successfully, the student will be able to			
CO 1	Remember the fundamental principles and techniques of AI.	PSO 1	K1
CO 2	Demonstrate the different rules and algorithms on the input data to get the desired output.	PSO 2, PSO 3, PSO 4, PSO 5	K2
CO 3	Apply the artificial thinking ability to accomplish tasks.	PSO 2, PSO 3, PSO 4, PSO 5	K3
CO 4	Discover systems that can detect, interpret, process, and forecast real world problems.	PSO 2, PSO 3, PSO 4, PSO 5	K4
CO 5	Choose intelligent system based on emerging problems.	PSO 2, PSO 3, PSO 4, PSO 5	K5

SYLLABUS				
UNIT	CONTENT	HOURS	COs	BLOOM'S TAXONOMY LEVEL
I	What is AI?-Foundation of AI- History of AI- Intelligent Agents: Agents and Environment-Nature of Environment-Structure of Agents	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
II	Problem Solving-Solving Problem by Searching- Problem solving Agents- Searching for Solutions-Uninformed search strategies- Breadth first Search – Depth first search.	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
III	Knowledge –syntax and semantics of First order logic-using first order logic- Knowledge engineering in first order Logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5

	chaining.			
IV	Planning and acting in the real world-Time schedules and resources-Hierarchical planning-Planning and acting in nondeterministic domain-multiagent planning	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
V	Learning-Reinforcement Learning – Passive Reinforcement Learning- Active Reinforcement learning-Generalization in Reinforcement learning- Policy Search- Applications of Reinforcement Learning	15	CO1 CO2 CO3 CO4 CO5	K1,K2,K3,K4, K5
Textbooks 1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, 2020,4 th Edition. 2. Elaine rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence”, TMH, 2017,3 rd Edition.				
References 1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", 4th Edition, Pearson Education. 2. Mishra R. B, 2011, Artificial Intelligence, Prentice Hall of India, 2nd Edition. 3. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence: a Logical approach", 2004, Oxford University Press.				
Suggested Reading 1. Roehrig, P., Pring, B., Frank, M. What To Do When Machines Do Everything: How to Get Ahead in a World of AI, Algorithms, Bots, and Big Data. Wiley, 2017.				
Web Resources 1. http://www.brainkart.com/subject/Artificial-Intelligence_144/ 2. https://epub.uni-regensburg.de/13629/1/ubr06078_ocr.pdf 3. https://cse.iitk.ac.in/users/cs365/2013/materials.html				

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	2	3	-	3	-	-	-	-	3	-	-	-	-	K1
CO 2	2	3	3	3	3	2	2	2	-	2	3	2	3	K2
CO 3	1	3	2	3	2	2	2	2	-	2	3	2	3	K3
CO 4	2	3	3	3	3	2	3	3	-	3	3	3	3	K4
CO 5	1	3	2	3	3	3	3	3	-	3	3	3	3	K5
Wt. Avg.	1.6	3	2.5	3	2.8	2.3	2.5	2.5	3	2.5	3	2.5	3	
Wt. Avg.	2.4								2.8					

Project

Course Code			
Credits	5		
Hours / Cycle	6		
Category	Part III	Core	Practical
Semester	VI		
Year of Implementation	From the academic year 2023-2024 onwards		
Course Objectives) To develop applications for real world problems.) To propose optimized solutions for existing systems.		
CO #	Course Outcome(s)	PSO Addressed	Bloom's Taxonomy Levels
On completing the course successfully, the student will be able to			
CO 1	Identify and define the problem statement	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO 2	Apply the basic concepts and explain the problem.	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO 3	Develop the phases of software development life cycle.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO 4	Analyze an optimized solution with domain specific knowledge and trending technology.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO 5	Choose test cases and confirm the sustainability of the solution for implementation.	PSO1, PSO2, PSO3, PSO4, PSO5	K5

Course Articulation Matrix														
Course Outcomes	Programme Outcomes								Programme Specific Outcomes					Cognitive Level
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	3	3	3	3	3	3	3	3	3	3	3	3	K1
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	K2
CO 3	2	3	3	3	3	3	2	3	3	3	3	3	3	K3
CO 4	2	3	3	3	3	2	2	3	3	3	3	3	3	K4
CO 5	1	2	3	3	3	3	2	3	3	3	3	3	3	K5
Wt. Avg.	2.2	2.8	3	3	3	2.8	2.4	3	3	3	3	3	3	
Wt. Avg.	2.7								3.0					