

Department of Computer Science (PG)

Programme Specific Outcomes (PSOs)

On the successful completion of the Postgraduate programme, the students will be able to

PSO1 Disciplinary Knowledge	demonstrate their mastery in emerging technologies in the field of computer science and realize the necessity of the IT field for professional development.
PSO2 Communication Skills	communicate effectively with the team members and society able to make effective presentations and writing reports and documentation.
PSO 3 Problem Solving & Analytical Reasoning	identify, formulate and analyse complex problems, reach conclusions using principles of mathematics and computer science.
PSO 4 Critical Thinking	create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilitate start-ups and high potential organizations.
PSO 5 Research Skills	make use of research knowledge and research methods to provide valid conclusions.
PSO 6 Digital Literacy	act as an employable, ethical and innovative professional to sustain in the digital business world.
PSO 7 Professional competencies	function effectively as an individual/member or leader in diverse teams and multidisciplinary environment.
PSO 8 Moral and Ethical Awareness/Reasoning	contribute to the development of the society by appraising environmental and social issues with ethics and interact with diverse individuals from pluralistic democratic society.
PSO 9 Multicultural Competence	demonstrate respectful engagement with others ideas, behaviours, beliefs and apply diverse frames of reference to decisions and actions.
PSO 10 Self-directed & Lifelong Learning	recognize the need for passion towards independent and life-long learning in the context of technological change in the field of computer science.

Department of Computer Science (PG)
Learning Outcomes-based Curriculum Framework (LOCF)
w.e.f 2024-2025

Sem	Category	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	CC	24PCS4501	Design and Analysis of Algorithms	6	5	100
1	CC	24PCS4401	Python Programming	5	4	80
1	CC	24PCS4301	Python Programming Lab	5	3	60
1	CC	24PCS4303	Probability and Statistics	4	3	60
1	DSE	24XXXNNNN	<i>Discipline Specific Elective – I</i>	6	5	100
1	GE	24XXXNNNN	<i>Generic Elective - I</i>	4	3	60
	Total			30	23	460
2	CC	24PCS4402	Cloud Computing	5	4	80
2	CC	24PCS4404	Advanced Java	5	4	80
2	CC	24PCS4302	Advanced Java Lab	5	3	60
2	CC	24PCS4406	Advanced Operating System	5	4	80
2	DSE	24XXXNNNN	<i>Discipline Specific Elective – II</i>	6	5	100
2	GE	24XXXNNNN	<i>Generic Elective - II</i>	4	3	60
	Total			30	23	460
3	CC	24PCS5401	Data Mining & Warehousing	5	4	80
3	CC	24PCS5403	Advanced Database Management System	5	4	80
3	CC	24PCS5301	Advanced Database Management System Lab	4	3	60
3	CC	24PCS5405	Digital Image Processing (TcL)	5	4	80
3	CC	24PCS5407	Advanced Software Engineering	5	4	80
3	DSE	24XXXNNNN	<i>Discipline Specific Elective – III</i>	6	4	80
3	IS	24PCS5233	Internship*	-	2	40
	Total			30	25	500
4	CC	24PCS5502	Data Analytics Using R (TcL)	6	5	100
4	CC	24PCS5504	Network Security and Cryptography	6	5	100
4	CC	24PCS5402	Research Methodology	6	4	80
4	CC	24PCS5506	Project	6	5	100

4	DSE	24XXXNNNN	<i>Discipline Specific Elective – IV</i>	6	4	80
4	SEC	24PCS5244	Professional Competency Skill	-	2	40
Total				30	25	500
Grand Total				120	96	1920

* Internship - First Year Vacation (30 Hrs.)

Discipline Specific Elective (DSE)

Sem	Category	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	DSE	24PCS4503	Web Programming (TcL)	6	5	100
		24PCS4505	Multimedia Technologies (TcL)			
		24PCS4507	Robotic Process Automation (TcL)			
2	DSE	24PCS4502	Artificial Intelligence and Machine Learning	6	5	100
		24PCS4504	Android Programming (TcL)			
		24PCS4506	Compiler Design			
3	DSE	24PCS5409	Natural Language Processing	6	4	80
		24PCS5411	Information Retrieval			
		24PCS5413	Cyber Security			
4	DSE	24PCS5404	Computational Intelligence	6	4	80
		24PCS5406	Internet of Things			
		24PCS5408	Block Chain Technology			

Generic Elective (GE)

Sem	Category	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	GE	24PCS4305	Introduction to WordPress (TcL)	4	3	60
		24PCS4307	3D Animation (TcL)			
2	GE	24PCS4304	Introduction to Artificial Intelligence (TcL)	4	3	60
		24PCS4306	Documentation using Latex (TcL)			

Mapping with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PCS	3	3	3	3	3	3	3	2	2	2

Mapping of Courses with PSOs

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
24PCS4501	3	2	3	3	2	3	2	2	2	2
24PCS4401	3	3	3	3	2	3	3	2	2	2
24PCS4301	3	3	3	3	2	3	3	2	2	2
24PCS4303	3	2	3	3	1	3	2	3	2	2
24PCS4503/ 24PCS4505/ 24PCS4507	3	2	3	3	2	3	3	3	2	2
24PCS4402	3	3	2	3	2	3	3	2	2	2
24PCS4404	3	3	3	3	3	3	2	1	2	2
24PCS4302	3	3	3	3	3	3	2	2	2	2
24PCS4406	3	2	3	3	3	3	3	2	3	2
24PCS4502/ 24PCS4504/ 24PCS4506	3	3	3	3	3	3	2	2	2	2
24PCS5401	3	3	3	3	3	3	2	2	2	2
24PCS5403	3	3	3	3	3	3	2	1	2	2
24PCS5301	3	3	3	3	3	3	2	2	2	2
24PCS5405	3	3	3	3	3	3	3	2	2	2
24PCS5407	3	3	3	3	3	2	2	2	2	2
24PCS5409/ 24PCS5411/ 24PCS5411	3	3	3	3	3	3	2	2	2	2
24PCS5233	3	3	3	3	3	3	2	2	2	2
24PCS5502	3	2	3	2	2	3	3	1	2	2
24PCS5504	3	2	3	3	3	3	2	3	2	2
24PCS5402	3	2	3	3	3	2	2	1	2	2
24PCS5506	3	3	3	3	3	3	2	2	2	2
24PCS5404/ 24PCS5406/ 24PCS5408	3	3	3	3	3	3	2	2	2	2
24PCS5244	3	3	2	2	2	2	2	1	1	2
Average	2.8	2.6	2.8	2.7	2.5	2.7	2.3	1.9	2.1	2.0

Mapping of Courses with POs

Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24PCS4305/ 24PCS4307	3	3	3	3	2	2	3	2	2	2
24PCS4304/ 24PCS4306	3	3	2	2	3	3	2	2	1	2
Average	3	3	2.5	2.5	2.5	2.5	2.5	2	1.5	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4501	Design and Analysis of Algorithms (T)	Core	6	5

This course enables the students in providing theoretical estimation for the required resources of an algorithm to solve computational problems. It also helps to examine algorithms to determine space and time complexities involved to examine the best algorithm according to a problem.

Course Outcomes:

At the end of the course, the student will be able to

CO1: interpret about algorithms and to determine complexities and also about various types of data structures.

CO2: distinguish specific search and sort algorithms for graph and tree.

CO3: identifies how to apply the greedy method and its algorithm.

CO4: describes graphs using dynamic programming techniques.

CO5: demonstrate the concept of backtracking, branch and bound technique.

Unit I

18 Hours

Introduction: Algorithm Definition and Specification - Space Complexity-Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues - Binary Tree - Binary Search Tree - Heap - Heap sort- Graph.

Unit II

18 Hours

Basic Traversal and Search Techniques: Techniques for Binary Trees-Techniques for Graphs -Divide and Conquer: - General Method - Binary Search - Merge Sort - Quick Sort.

Unit III

18 Hours

The Greedy Method: General Method-Knapsack Problem - Minimum Cost Spanning Tree- Single Source Shortest Path.

Unit IV**18 Hours**

Dynamic Programming- General Method-Multistage Graphs-All Pair Shortest Path-
Optimal Binary Search Trees - 0/1 Knapsacks - Travelling Salesman Problem - Flow
Shop Scheduling.

Unit V**18 Hours**

Back tracking: General Method-8-Queens Problem-Sum of Subsets-Graph Coloring-
Hamiltonian Cycles - Branch and Bound: - The Method - Travelling Salesperson.

Learning Resources:**Text Books**

1. Ellis Horowitz, "Computer Algorithms", Galgotia Publications.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms".

References

1. Good rich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2. Skiena," The Algorithm Design Manual", Second Edition, Springer,2008
3. Anany Levith," Introduction to the Design and Analysis of Algorithms", Pearson Education Asia, 2003.
4. Robert S edge wick, Phillipe Flajolet," An Introduction to the Analysis of Algorithms", Addison- Wesley Publishing Company, 1996.

Websites/e-Learning Resources

1. <https://nptel.ac.in/courses/106/106/106106131/>
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. <https://www.javatpoint.com/daa-tutorial>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	3	2	3	2	2	3	1
CO2	2	3	3	3	3	3	3	2	2	2
CO3	3	2	3	3	2	3	2	3	2	1
CO4	3	2	3	3	3	3	3	3	2	2
CO5	2	2	3	3	2	3	2	2	1	3
Total	13	12	15	15	11	15	12	12	10	9
Average	2.6	2.4	3	3	2.2	3	2.4	2.4	2	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4401	Python Programming (T)	Core	5	4

The course aims to enable the students to understand the fundamentals of python and its concepts. In completion of this course the student will be able to do statistical analysis and use appropriate tools for data visualization.

Course Outcomes:

At the end of the course, the student should be able to

CO1: demonstrate the building blocks, statements and data structures in Python.

CO2: explain the various programming paradigms in Python.

CO3: create scripts using arrays, functions, lists, tuples and dictionaries.

CO4: discover the relationship among the numerical data using Numpy for doing statistical analysis.

CO5: derive the appropriate tools for plotting and interpret the data through Matplotlib for visualization to give possible solutions.

Unit I

15 Hours

Program - Running Python - The First Program - Arithmetic Operators - Values and Types - Formal and Natural language - Debugging. Variables - Expressions and Statements: Assignments Statements - Variable Names - Expressions and Statements - Script mode - Order of Operations- String Operations - Comments. Functions - Function Call - Math Functions - Composition - Adding New Functions - Definitions and Uses - Flow of Execution - Parameters and Arguments - Variable and Parameters - Stack Diagrams.

Unit II

15 Hours

Floor Division and Modulus - Boolean Expression - Logical Operators- Conditional Execution - Alternative Execution - Chained Conditionals - Nested Conditionals - Recursion - infinite Recursion - Keyboard Input. Fruitful Functions: Return values - Incremental Development - Composition- Boolean Functions - More Recursion -

Leap of faith. Iteration: reassignment - Updating variables - while - Break - algorithms.

Unit III

15 Hours

Len - Traversal - String Slices - Strings are immutable - searching - Looping and Counting - String methods - The in operator - string Operation. Lists: A List is a sequence - lists are mutable - traversing a List - List Operations - List slices - List methods- Map, filter and Reduce - Deleting Elements - Lists and strings - Objects and values - Aliasing - List arguments. Dictionaries: A Dictionary is a Mapping - Dictionary as a collection of counters - Looping and Dictionaries - Reverse Lookup - Dictionaries and Lists- Memos- Global Variables. Tuples: Tuples Are Immutable - Tuple Assignment - Tuples as Return Values - Tuples as Return Values - Variable-Length Argument Tuples - Lists and Tuples - Dictionaries and Tuples.

Unit IV

15 Hours

Numpy a Little History - N-dimensional array - The Heart of the library - Basic Operations - Indexing, Slicing and Iterating - Conditional and Boolean Arrays - Shape Manipulation - Array Manipulation - General Concepts - Structured Arrays - Reading and Writing Array Data on Files. PANDAS library - An Introduction: Introduction to Pandas Data Structures - Functionalities on Indexes - Operation between Data Structures - Function Application and mapping - Sorting and Ranking - Correlation and Covariance - Not a Number - Hierarchical indexing and Levelling.

Unit V

15 Hours

Matplotlib Library - Architecture -pyplot- The Plotting Window -kwargs- Adding Elements to The Chart - Saving Charts - Handling Date Values - Chart Typology - Line Charts - Histograms - Bar Charts - Pie Charts - Advanced Charts - 3D Toolkit - Multi-Panel Plots.

Learning Resources:

Text Books

1. Allen B. Downey, Think Python, 2nd Edition, Published by O'Reilly Media Inc., USA, 2015.

- Fabio Nelli, Python Data Analytics with Pandas, NumPy, and Matplotlib, 2nd Second Edition, Apress, UK, 2018.

References

- Michael Minelli, Michele chambers, Ambiga Dhiraj, Big Data Analytics- Emerging Business Intelligence and Analytic Trends for Today's Business, Wiley CIO Series, New Jersey, USA, 2014.
- Chun, J Wesley, Core Python Programming, 3rd Edition, Pearson, UK, 2012.
- Jake VanderPlas, Python Data Science Handbook, O'Reilly Media Publishers, USA, 2016.
- Yashavant Kanetkar, Aditya Kanetkar, "Let Us Python", 6th Edition, 2024, BPB Publications, New Delhi.

Websites/e-Learning Resources

- <https://www.programiz.com/python-programming/>
- <https://www.tutorialspoint.com/python/index.htm>
- https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	2	2	2	2	2	2	2
CO2	3	3	3	3	2	3	3	2	3	2
CO3	3	3	3	3	2	3	3	2	3	2
CO4	3	2	3	3	3	3	3	3	2	1
CO5	3	2	3	3	3	3	3	3	2	1
Total	15	13	15	14	12	14	14	12	12	8
Average	3	2.6	3	2.8	2.4	2.8	2.8	2.4	2.4	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours /Wk.	Credits
24PCS4301	Python Programming Lab (L)	Core	5	3

The course aims at enabling the students to understand the fundamentals of python and its concepts. In completion of this course the student will be able to do statistical analysis and use appropriate tools for data visualization.

Course Outcomes:

At the end of the course, the student should be able to

CO1: explain the various programming paradigms in Python.

CO2: demonstrate the building blocks, statements and data structures in Python.

CO3: create Python scripts using arrays, functions, lists, tuples and dictionaries.

CO4: implement Python scripts to utilize numpy and pandas library.

CO5: demonstrate different charts to visualize data using Matplotlib.

List of Programs:

Implement the following in Python:

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a python program to find the square root of a given number.
4. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: $c/5 = f-32/9$].
5. Defined as a function F as $F_n = F_{n-1} + F_{n-2}$. Write a Python program which accepts a value for N (where $N > 0$) as input and pass this value to the function. Display a suitable error message if the condition for input value is not followed.
6. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
7. Write a python program to find the largest of three numbers.

8. Write a Python program to construct the following pattern, using a nested for loop Programs using conditional branches.

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

9. Write a Python script that prints prime numbers less than 20.
10. Write a python program to find the factorial of a number using Recursion.
11. Write a program to create, concatenate and print a string and access a substring from a given string using a list.
12. Write a program to create, append, and remove lists in python.
13. Write a program to demonstrate working with tuples in python.
14. Write a program to demonstrate working with dictionaries in python.
15. Write a program to sort an element in a dictionary in python.
16. Write a program to demonstrate arrays in NumPy.
17. Write a program to demonstrate array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.
18. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data in NumPy.
19. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file.
20. Implement a Python program to perform File Operation on Excel Data Set using Pandas Library.
21. Write a Python script to implement a bar plot.
22. Write a Python program to prepare histogram.
23. Implement a Python program to prepare a distribution plot.
24. Implement a Python program to draw box plot.
25. Implement a Python program to prepare scatter plot.

Learning Resources:**Text Books**

1. Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition - Second Release, 2014.
2. Allen B. Downey, Think Python, 2nd Edition, Published by O’Reilly Media Inc., USA, 2015.

References

1. David M. Beazley, “Python Essential Reference”, Developer’s Library, Fourth Edition, 2009.
2. Chun, J Wesley, Core Python Programming, 3rd Edition, Pearson, UK, 2012.

Websites/e-Learning Resources

1. <https://www.programiz.com/python-programming/>
2. <https://www.tutorialspoint.com/python/index.htm>
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	2	3	2	2	2	2	2	2	2	2
CO2	3	3	3	3	2	3	3	2	3	2
CO3	3	3	3	3	2	3	3	2	3	2
CO4	3	2	3	3	3	3	3	3	2	1
CO5	3	2	3	3	3	3	3	3	2	1
Total	14	13	14	14	12	14	14	12	12	8
Average	2.8	2.6	2.8	2.8	2.4	2.8	2.8	2.4	2.4	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4303	Probability and Statistics (T)	Core	4	3

This course deals with Counting Principles, Probability Theory, Random Variables, Special Distributions and Testing of Hypothesis.

Course outcomes:

At the end of the course, the student should be able to

CO1: remember the basic concepts of probability/statistics.

CO2: compute probability using addition, multiplication theorem and Baye's theorem

CO3: explain mathematical descriptions of random variables including distribution function, probability density functions, mathematical expectations, moment generating function and characteristic function

CO4: apply the theoretical distributions to solve problems

CO5: identify and apply sampling techniques to test hypothesis

Unit I

12 Hours

Two Basic Principles – Simple Arrangement and Selections with or without Repetitions – Binomial Identities.

Unit II

12 Hours

Probability Function – Addition and Multiplication Theorems on Probability – Conditional Probability – Baye's Formula and Theorem.

Unit III

12 Hours

Discrete – Continuous Random Variables – Distribution Function– Probability Density Function – Mathematical Expectations – Moment Generating Function – Characteristic Function.

Unit IV

12 Hours

Binomial – Poisson – Normal Distributions.

Unit V**12 Hours**

Sampling – Sampling Distribution – Testing of Hypothesis – Test of Significance – t-distribution – F-test – χ^2 -distribution.

Learning Resources:**Text Book**

1. A.W. Tucker, Applied Combinatorics, Wiley, 2011.
Unit 1: Chapter 5(sec 5.1 to 5.3, 5.5)
2. S. Arumugam & A. Thangapandian Issac, Statistics, New Gamma Publication House, 2013.
Unit 2: Chapter 11 (problems only)
Unit 3: Chapter 12(sec 12.1 to 12.6)
Unit 4: Chapter 13(sec 13.1 to 13.3) (problems only)
Unit 5: Chapter 14(Sec 14.1 to 14.3); Chapter 15(sec 15.1 to 15.2);
Chapter 16(sec 16.1 to 16.3)

References

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Tenth Edition Sultan Chand and Sons, 2000.
2. Irwin Miller and Marlyees Miller, John E Freund's Mathematical Statistics with Applications, Eight Edition, PHI Learning, 2012.
3. S.M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Fourth Edition, Elsevier, 2009.

Websites/e-Learning Resources

1. www.nptel.videos.com/mathematics/
2. nptel.ac.in/courses/122104017
3. nptel.ac.in/courses/111105035

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	3	1	3	2	3	2	2
CO2	3	2	3	3	1	3	2	3	2	2
CO3	3	2	3	3	1	3	2	3	2	2
CO4	3	2	3	3	1	3	2	3	2	2
CO5	3	2	2	3	1	3	2	3	2	1
Total	15	10	14	15	5	15	10	15	10	9
Average	3	2	2.8	3	1	3	2	3	2	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4503	Web Programming (TcL)	DSE	6	5

This course aims at preparing the students to gain theoretical skills and practical experience required for designing web pages and uses a variety of latest technologies to create responsive websites.

Course Outcomes:

At the end of the course, the student will be able to

CO1: describe Web Basics, history of Internet and use HTML tags, attributes and write simple web pages.

CO2: apply DHTML to web pages and make it dynamic.

CO3: recognize PHP commands and write programs.

CO4: explain database connectivity in the context of PHP.

CO5: create a web page with AngularJS.

Unit I

18 Hours

Introduction, Concept of Internet - History of Internet - Protocols of Internet, World Wide Web, URL - Web Server - Web Browser. Introduction - History of HTML - Structure of HTML Document - Text Basics - Images and Multimedia - Links and webs - Document Layout - Cascading Style Sheet- HTML 4 style sheet features - Creating Forms - Frames and Tables.

Unit II

18 Hours

Introduction of DHTML- HTML vs. DHTML - Advantages of DHTML - CSS of DHTML - Event Handling - Data Binding - Browser Object Models.

Unit III

18 Hours

Introduction and basic syntax of PHP, decision and looping with examples - PHP and HTML - Arrays - Functions - Browser control and detection - string - Form processing - Files - Advance Features: Cookies and Sessions - Object Oriented Programming with PHP.

Unit IV**18 Hours**

Basic commands with PHP examples - Connection to server - creating database - selecting a database - listing database - listing table names - creating a table - inserting data - altering tables- queries - deleting database - deleting data and tables - PHPMyAdmin and database bugs.

Unit V**18 Hours**

Introduction to AngularJS - Expressions - modules - Directives - data binding - services - tables - Events - forms - API - SQL - DOM.

Learning Resources:**Text Books**

1. “HTML5 Black Book: Covers CSS3, and PHP ”, Kogent Learning Solutions Inc 2016.
2. Moulding, Peter, “PHP Black Book”, Dream tech Press Ltd, 2001.

References

1. Ecky Putrady, “Practical Web Development with Haskell: Master the essential skills to build fast and scalable web applications”, 1st edition, Apress, 2018.
2. Danny Goodman, “Dynamic HTML” 3rd Edition, O’reilly, 2006.
3. Jon Duckett, “PHP & MYSQL Server side development”, 1st edition 2019.
4. Nathan Murray, Felipe Coury, “Ng Book: The Complete guide to Angular”, 5th edition, Create space Independent Publishing Platform, 2018.

Websites/ e-Learning Resources

1. <https://www.tutorialspoint.com/html/index.htm>
2. <https://www.geeksforgeeks.org/dhtml-introduction/>
3. <https://www.tutorialspoint.com/php/index.htm>
4. <https://www.tutorialspoint.com/angularjs/index.htm>
5. <https://www.tutorialspoint.com/angularjs/index.htm>
6. <https://www.w3resource.com/angular/getting-started-with-angular.php>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	2	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	2	3	3	2	2	3	2	3	2
CO4	3	3	3	3	2	2	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2
Total	12	12	13	13	11	11	13	12	13	9
Average	2.4	2.4	2.6	2.6	2.2	2.2	2.6	2.4	2.6	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4505	Multimedia Technologies (TcL)	DSE	6	5

The course aims at enabling the students to understand the fundamentals of the underpinning technologies in graphics, distributed systems and multimedia. Each student explores with experience in the generation of animations, virtual environments and multimedia applications, allowing the expression of creativity.

Course Outcomes:

At the end of the course, the student will be able to

CO1: interpret the concepts, principles and theories of Multimedia Applications.

CO2: employ the knowledge and understanding of the current issues involved with development and deployment of multimedia system.

CO3: analyze and solve problems related to their expertise in Multimedia Applications.

CO4: derive their ability to extend their basic knowledge to encompass new principles and practice.

CO5: create and deploy their computing, technical and theoretical skills by developing a substantial Multimedia application.

Unit I

18 Hours

Introduction to Multimedia Systems design- Elements- Systems architecture and technologies- Objects for multimedia systems- Multimedia data interface standards- Multimedia Databases- Data Compression-lossy and lossless compression.

Unit II

18 Hours

Data and file format standards RTF-TIFF-RIFF-MIDI- JPEG -AVI- MPEG Standard- video and image display systems, image scanners -Digital voice and audio- Digital camera-video images and animation- Full motion video.

Unit III

18 Hours

Telecommunications considerations for Multimedia- Specialized processors- ISDN- LAN and WAN for Enterprise Multimedia Applications- Distributed Object Model-

Multimedia communication protocol-UDP, TELNET-Multimedia Applications and Design issues -Virtual Reality -Design, Components of Multimedia Systems.

Unit IV

18 Hours

Multimedia Authoring and User Interface- Design Considerations-Hypermedia Applications-Information Access- Object display- Hypermedia Messaging- Integrated document Management.

Unit V

18 Hours

Distributed Multimedia Systems-Components-Client-server Operation- Object Server-Network Performance Issues- Distributed Multimedia databases- Managing distributed Objects-System Design- Design issues- requirements- feasibility- Performance Analysis.

Learning Resources:

Text Books

1. Prabhat K Andleigh and Kiran Thakrar “Multimedia Systems Design” (PHI Publications).
2. Fred Halsall,” Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew, ”Fundamentals of Multimedia” (Pearson Publications).
4. John K. Koegel Buford, “Multimedia Systems” (Pearson Education)

References

1. Game Engineering Design & Implementation - Alan Thorn, Pub: Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development: Chandler & Chandler, Pub: Jones & Bartlet (VIVA Pub.)

Websites/ e-Learning Resources

1. <https://www.techtarget.com/whatis/definition/lossless-and-lossy-compression>
2. https://www.brainkart.com/article/Data-and-File-Formats-Standards_10196/
3. <https://www.nextiva.com/blog/what-is-isdn.html>
4. <https://wachemo-elearning.net/courses/multimedia-systems-course-module-itec3121/lessons/chapter-one-introduction-to-multimedia/topic/1-3-hypermedia-and-multimedia>

5. https://www.brainkart.com/article/Distributed-Multimedia-Systems_10209/

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	3	3	3	2	1	2	2
CO2	3	3	3	3	2	2	3	3	2	3
CO3	3	3	2	3	3	3	2	2	2	2
CO4	2	3	3	3	2	3	3	2	3	2
CO5	3	3	3	3	3	3	3	2	2	3
Total	14	14	15	15	13	14	13	10	11	12
Average	2.8	2.8	3	3	2.6	2.8	2.6	2	2.2	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4507	Robotic Process Automation (TeL)	DSE	6	5

This course enables the students to learn the basic concepts of Robotic Process Automation. It helps the students to familiarize the RPA tools that are most relevant in the industry and explores the various options/tools available in UiPath Studio.

Course Outcomes:

At the end of the course, the student will be able to

CO1: explain the fundamentals of Robotic Process Automation.

CO2: explores the various options/tools available in UiPath Studio.

CO3: offer comprehensive knowledge on developing software robots.

CO4: explore the challenges and risks when implementing RPA.

CO5: familiarize the creation of bots and implement simple bots.

Unit I

18 Hours

Scope and techniques of automation - Robotic Process Automation - Components of RPA -RPA platforms- About UIPath- Learning UIPath Studio.

Unit II

18 Hours

Sequence - Activities - Using activities with workflows - Control flow - Assign, Delay, Break, while, do while, for each, if, switch activity - Data manipulation - Variables and scope, Data table usage with examples.

Unit III

18 Hours

Taking control of the Controls - Finding and attaching windows - Finding the control - Act on controls - mouse and keyboard activities - Working with UIExplorer - Handling events - Screen scraping.

Unit IV**18 Hours**

Handling User events and Assistant Bots - Monitoring system event triggers - Launching an assistant upon a keyboard event - Exception handling - Common exceptions and ways to handle them - Debugging techniques - Error reporting.

Unit V**18 Hours**

Managing and maintaining the code - Project organization - Nesting workflows - Reusability of workflows - Deploying and maintaining the Bot - Publishing using publish utility.

Learning Resources:**Text Book**

1. Alok Mani Tripathi, 2018. Learning Robotic Process Automation, 1st Edition, Packt Publishers.

References

1. Tom Taulli, 2020. The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, O'Reilly.
2. Gerardus Blokdyk, 2020. Robotic Process Automation RPA - A complete guide, Kindle edition.
3. Nandan Mullakara, Arun Kumar Asokan, 2020. Robotic Process Automation Projects, Packt Publishing.

Websites/ e-Learning Resources

1. <https://www.automationanywhere.com/rpa/robotic-process-automation>
2. <https://enterpriseproject.com/article/2019/5/rpa-robotic-process-automation-how-explain>
3. <https://www.cio.com/article/227908/what-is-rpa-robotic-process-automation-explained.html>
4. <https://www.javatpoint.com/rpa>
5. https://www.tutorialspoint.com/uiopath/uiopath_robotic_process_automation_introduction.htm
6. https://onlinecourses.nptel.ac.in/noc19_me74/preview

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	3	3	3	2	1	2	2
CO2	3	3	3	3	2	3	3	3	1	3
CO3	3	2	2	3	3	3	2	2	2	2
CO4	2	3	3	3	3	3	3	2	3	2
CO5	3	3	3	3	3	2	3	2	2	3
Total	14	13	3	15	14	14	13	10	10	12
Average	2.8	2.6	3	3	2.8	2.8	2.6	2	2	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4305	Introduction to WordPress (TcL)	GE	4	3

This course enables the students to create websites using WordPress and is able to create a content management system.

Course Outcomes:

At the end of the course, the student will be able to

CO 1: describe what WordPress is and what it can do.

CO 2: demonstrate installing and setting up for WordPress.

CO 3: apply graphics and images usage.

CO 4: analyze layout of your website and selecting a theme.

CO 5: apply using templates and plugins.

Unit I

12 Hours

WordPress - Getting Started - Creating an account on WordPress.com - Setting up your blog or web site - WordPress Settings-Take a tour of the Dashboard - Building and editing your Profile - Customizing the front page - Managing users - Managing comments - Permalinks.

Unit II

12 Hours

Posts-Posts vs. Pages - Text Formatting - Creating text links, adding images, and external URLs Setting up categories, tags, and other Elements - Publishing and editing a post - Pages - Creating Basic Pages - Page organization and hierarchy.

Unit III

12 Hours

Images, Video, and other Media - Media and the Admin Panel - Media from within posts and Pages - Inserting external media from YouTube - The Appearance Tab - Selecting a Theme - Understanding page widgets.

Unit IV**12 Hours**

Using a Theme - Changing the Background - Changing the header Image - Changing Formatting - Creating featured header images in posts and Pages - Using asides to create short Posts - Creating custom menus.

Unit V**12 Hours**

Launching a Self-Hosted WordPress Site - Installing WordPress - Understanding the WordPress File Structure - Importing and exporting existing content from different sources - plug-ins.

Learning Resources:**Text Book**

1. WordPress 5 Complete: Build beautiful and feature-rich websites from scratch, 7th Edition.

References

1. WordPress 4.0 Site Blueprints 2nd Edition: Build Your Own Website Using Best Practices.

Websites/e-Learning Resources

1. <https://learn.wordpress.org/tutorial/introduction-to-wordpress/>
2. <https://www.w3schools.in/wordpress/posts>
3. <https://www.w3schools.in/wordpress/creating-a-website-or-blog-in-wordpress>

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	2	2	1	1
CO2	2	2	2	2	2	2	2	2	1	1
CO3	3	2	2	3	2	2	2	2	2	2
CO4	3	3	3	3	2	2	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	13	12	12	13	11	11	12	10	8	8
Average	2.6	2.4	2.4	2.6	2.2	2.2	2.4	2	1.6	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4307	3D Animation (TcL)	GE	4	3

The course aims to enable the students to gain knowledge on basic principles of 3D Animation. It also enables the students to create animation using different effects and methods in 3D Studio Max.

Course Outcomes:

At the end of the course, the student will be able to

CO1: explain the basic principles and primitives in 3D Studio Max.

CO2: demonstrate the rendering methods.

CO3: apply modifiers to create a new model.

CO4: create basic animation using keyframes.

CO5: describe the light effects and apply scenes.

Unit I

12 Hours

Introduction to Animations- Types of Animations - Animation Methods - Storyboard - Introduction to 3D Max - Interface Basics -Caption bar - Quick Access Toolbar - Menu Bar - Main Toolbar - Command Panel - Animation Tools and Controls - Viewports - Viewport Controls - View Cube and Steering Wheels-Understanding Geometry Primitives- Standard Primitives - Extended Primitives - Architectural Objects- AEC Extended Objects - Doors - Stairs - Windows - Shapes: Splines and Extended Splines - Compound Objects - Dynamics Objects.

Unit II

12 Hours

Working with Object- Creating object - Transforming object - Cloning object - Grouping and Ungrouping object - Linking and Unlinking object -Working with Modifiers: Understanding Modifier Types - Modifier stack - Applying Modifiers: Bend -Tapper Twist - shell - Working with Splines: Drawing Splines - Editing Splines - Rendering Splines - Maps and materials.

Unit III**12 Hours**

Modelling Concept- Primitives - Polygons - Using Graphic Modelling -Creating Mesh object -Applying the Edit poly modifier - NURBS Modelling - Creating and Simulating a Cloth Object - Creating and Simulating a Soft Body Collection - Creating a Wind Object - Creating a Wind Object. Lights: Understanding Lights - Types of lights - Creating Lights - Creating Sunlight and Daylight Systems - Working with Shadows: Shadow Map Shadows - Applying Shadows to light.

Unit IV**12 Hours**

Working with Cameras-Types of Camera - Camera Viewport - Camera Parameters - Animating Camera. Understanding the Animation Concepts: Setting up the Frame Rate - Setting up the Speed and Direction - Using the Auto Key Mode - Using the Set Key Mode - Working with Biped: Creating Biped - Manipulating Biped - Animating a Biped.

Unit V**12 Hours**

Particle Systems-Basic of Particle System - Types of Particle Systems - Creating a Particle System for Rainfall Effect - Working with Space Warps:Basic of Space Warps - Types of Space Wraps - Applying Space Wraps.Rendering Animation: Rendering - Rendering Methods - Render Scene Dialog Box - Rendering Tools - Previewing Animation.

Learning Resources:**Text Book**

1. Kogent Learning Solutions Inc., (2010), “3ds Max 2010 in Simple Steps”, Dream Tech Press, New Delhi.

References

1. Murdock (Kelly L.) (2013), “Autodesk 3ds Max 2013 Bible”, Wiley Pvt. Ltd.

Websites/ e-Learning Resources

1. <https://area.autodesk.com/m/redefinefx/tutorials/3ds-max-2022-tutorial-beginner-crash-course-start-here>
2. <https://3dsmxtutorial.com/>

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	2	1	2	2
CO2	3	3	3	3	3	3	3	1	2	3
CO3	3	3	2	3	2	2	2	1	2	2
CO4	2	3	3	3	3	3	3	1	3	3
CO5	3	3	3	3	2	2	3	1	3	2
Total	14	14	14	15	13	13	13	5	12	12
Average	2.8	2.8	2.8	3	2.6	2.6	2.6	1	2.4	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4402	Cloud Computing (T)	Core	5	4

The course aims to enable the students to gain knowledge on cloud computing, cloud services, architectures and its applications. It also enables the students to learn the basics of cloud computing with real time.

Course Outcomes:

At the end of the course, the student will be able to

CO1: demonstrate the concepts of Cloud and its services.

CO2: collaborate cloud for Event & Project Management.

CO3: analyze on cloud in-Word Processing, Spreadsheets, Mail, Calendar, and Database.

CO4: analyze cloud in social networks.

CO5: explore cloud storage and sharing.

Unit I

15 Hours

Introduction: Cloud Computing Introduction - From - Collaboration to cloud - working of cloud computing - pros and cons, benefits - developing cloud computing services - Cloud service development - discovering cloud services.

Unit II

15 Hours

Cloud computing for everyone: Centralizing email communications - cloud computing for community - collaborating on schedules - collaborating on group projects and events - cloud computing for corporation - mapping - schedules - managing projects - presenting on road.

Unit III

15 Hours

Using Cloud Services: Collaborating on calendars - Schedules and task management - exploring online scheduling and planning - collaborating on event management - collaborating on contact management - collaborating on project management - collaborating on word processing -spreadsheets- and databases.

Unit IV**15 Hours**

Outside the Cloud: Evaluating webmail services - Evaluating instant messaging - Evaluating web conference tools - creating groups on social networks - Evaluating online groupware - collaborating via blogs and wikis.

Unit V**15 Hours**

Storing and Sharing: Understanding cloud storage - evaluating online file storage - exploring online bookmarking services - exploring online photo editing applications - exploring photo sharing communities - controlling it with web based desktops.

Learning Resources:**Text Book**

1. Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.

References

1. Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata Mc Graw Hill Education Private Limited, 2009.

Websites/e-Learning Resources

1. <https://nptcl.ac.in/courses/106/105/106105167/>
2. https://www.tutorialspoint.com/cloud_computing/index.htm
3. <https://www.javatpoint.com/cloud-computing-tutorial>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	2	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	2	2	3	2	2	1
CO3	3	3	2	3	2	3	3	2	2	2
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	3	3	3	2	3	3	2	2	2
Total	13	13	12	13	10	13	14	10	10	8
Average	2.6	2.6	2.4	2.6	2	2.6	2.8	2	2	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4404	Advanced Java (T)	Core	5	4

This course enables the students to learn the basic function, principles and concepts of advanced Java Programming. It also aims to learn Window based applications using Swing Objects, TCP/IP socket programming, JDBC and Server-side Programming.

Course Outcomes:

At the end of the course, the student should be able to

CO1: find solutions for a range of problems using object-oriented programming.

CO2: discuss the Java GUI Components.

CO3: construct to design and develop Java program using Swings Components.

CO4: apply and analyze Java in Database and Networking concepts.

CO5: design interactive applications using Java Servlet and JSP.

Unit I

15 Hours

General Form of a Class - Creation of Objects -Usage of Constructors - 'this' Keyword- Constructor Overloading-Copy Constructors- Inheritance and Polymorphism-Inheriting Variables in a Class - Inheriting Methods in a Class - Inheritance and Constructors Abstract Classes - Final Classes

Unit II

15 Hours

Applets- The Life Cycle of an Applet - Syntax of Applet Tag -Display method in Applet - Methods in the Graphic Class-Displaying graphics in Applet -The Applet Class Development and Execution of a Simple Applet -Layout Managers in Java.

Unit III

15 Hours

AWT Component Classes- Labels-Buttons-Checkboxes-List-Text field-Text area Menubar-Swing Component Classes-Hierarchy of Java Swing Classes-Swing Components- JLabel Control -Joption Pane Class -Jtext Field Control -JButton Control - JCheckBox Control -Jradio Button Control Menus-JProgress Bar.

Unit IV**15 Hours**

Networking in Java -Java Socket Programming -TCP Server Socket Class - TCP Socket Class. Java Database Connectivity: Common JDBC Components-Establishing A Connection - Creation of Data Tables Entering Data into the Tables.

Unit V**15 Hours**

Java Server Pages (JSP)- Introduction -architecture - advantages -Life Cycle - Components of JSP Page -The Scriptlet-JSP Directives-JSP Actions-Comments-JSP implicit Object-Control Flow in JSP-Servlet-Dynamic Webpages- Life Cycle of a Servlet - Handling HTTP Request and Response (GET / POST Request).

Learning Resources:**Text Books**

1. “Core and Advanced Java”, Black Book DT Editorial Services,2018
2. “Advanced Java Programming” E. Ramaraj- 2020

References

1. E Balagurusamy, Programming with JAVA, 6th Edition, Tata McGraw Hill, New Delhi, 2019.
2. Herbert Schildt, Java 2: Complete Reference, 11th Edition, Tata McGraw Hill, New Delhi, 2018.
3. Mark Lassoff, Java Programming for Beginners, 1st Edition, Packt Publishing, UK, 2017.

Websites/e-Learning Resources

1. https://www.tutorialspoint.com/java/java_object_classes.htm
2. <https://www.geeksforgeeks.org/component-class-in-java/>
3. <https://www.tutorialride.com/core-java/applet-programming-in-java.htm>
4. <https://www.baeldung.com/a-guide-to-java-sockets>
5. <https://www.techcharge.in/jdbc-components/>
6. <https://www.turing.com/kb/javaserver-pages-overview-and-elements>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	2	2	2	2	2	1	2	2
CO2	3	3	3	3	3	3	2	2	1	3
CO3	3	3	3	3	3	3	3	1	3	2
CO4	3	3	3	3	3	3	2	1	3	2
CO5	3	3	3	3	3	3	1	1	3	2
Total	15	14	14	14	14	14	10	6	12	11
Average	3	2.8	2.8	2.8	2.8	2.8	2	1.2	2.4	2.2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4302	Advanced Java Lab (L)	Core	5	3

This course enables the students to develop and design GUI applications using Swings. It also enhances knowledge to manipulate and store data by JDBC and understand Socket programming and its implementation.

Course Outcomes:

At the end of the course, the student should be able to

CO1: discuss the concepts related to Java Technology.

CO2: able to develop Applets for GUI applications.

CO3: construct the capable of implementing JDBC.

CO4: design networking applications using socket programming concepts.

CO5: create interactive web-based applications using servlets and JSP.

List of Programs:

1. Develop a java program to display the employee details using class and object.
2. Develop a program to demonstrate the method overloading concept in Java.
3. Develop a Java Program to implement inheritance.
4. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.
5. Write a program for passing parameters using Applet.
6. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button “Computer” is clicked.
7. Develop a Java Applet program to show the animation of a bouncing ball.
8. Write an applet to display selected geometric figure from a list.
9. Write a Java program that works as a simple calculator. Use a grid layout

to arrange

10. Buttons for the digits and for the +, -, *, % operations. Add a text field to display the result.
11. Write a java program to create a frame containing three buttons (Yes, No, Close). When button yes or no is pressed, the message "Button Yes/No is pressed" gets displayed in label control. On pressing CLOSE button frame window gets closed.
12. Write a Java program to create a combo box which includes list of subjects. Display the selected subject in the text field using Swing.
13. Develop a Java program to implement a Jprogress bar.
14. Develop a Java program to implement a Menubar where we can select multiple menu and display it.
15. Develop a Java program to draw a rectangle using swing.
16. Write a Java swing program to print a wave form with output.
17. Develop a Java program with JDBC to store the details of a person on to the database table.
18. Write a Java program with JDBC to access and display the details of a person stored in the databasc table.
19. Write a Java program with JDBC to access and delete the details of a given person stored in the database table.
20. Develop a java program to create a sample TCP chat application where client and server can chat with each other.
21. Write a program in JSP to auto refresh a page.
22. Develop a JSP application to demonstrate the session tracking.
23. Develop a JSP application to count the total number of visits on your website.
24. Write an application to auto refresh a page in servlet.
25. Develop a servlet program that accepts the employee details from user and displays the details on the next page.

Learning Resources:

Text Books

1. Jamie Jaworski, "Java Unleashed", SAMS Tech Media Publications, 1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 1999.

References

1. Deitel and Deitel, "Java How to Program", Third Edition, PHI/ Pearson Education Asia.

Websites/e-Learning Resources

1. <https://www.knowledgehut.com/tutorials/java-tutorial/java-applet>
2. <https://www.tutorialride.com/servlets/servlets-tutorial.htm>
3. <https://data-flair.training/blogs/jsp-hello-world-example/>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	3	3	3	2	2	2	2
CO2	2	3	3	3	3	3	2	2	1	2
CO3	3	2	3	2	2	3	2	2	2	2
CO4	3	3	2	3	3	2	2	2	2	2
CO5	3	3	3	3	3	3	2	2	3	2
Total	14	14	14	14	14	14	10	10	10	10
Average	2.8	2.8	2.8	2.8	2.8	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours /Wk.	Credits
24PCS4406	Advanced Operating System (T)	Core	5	4

This course empowers students to delve into Distributed Operating Systems, exploring their intricate components and management intricacies in real-time and mobile contexts. Additionally, it facilitates an in-depth understanding of case studies centered around Linux Operating Systems, enriching students' practical insights.

Course Outcomes:

At the end of the course, students will be able to

CO1: grasp the intricacies of architectural considerations linked with operating systems.

CO2: proficiently navigate through diverse process management paradigms encompassing scheduling, deadlock resolution, and distributed file systems.

CO3: demonstrate adeptness in formulating real-time task scheduling strategies.

CO4: evaluate operating systems tailored for handheld devices with analytical precision.

CO5: assess the operational dynamics of operating systems such as LINUX and iOS with discerning scrutiny.

Unit I

15 Hours

Basics of Operating Systems: What is an Operating System? - Main frame Systems - Desktop Systems - Multiprocessor Systems - Distributed Systems - Clustered Systems -Real-Time Systems - Handheld Systems - Feature Migration - Computing Environments -Process Scheduling - Cooperating Processes - Inter Process Communication- Deadlocks -Prevention - Avoidance - Detection - Recovery.

Unit II

15 Hours

Distributed Operating Systems: Issues - Communication Primitives - Lamport's Logical Clocks - Deadlock handling strategies - Issues in deadlock detection and resolution-distributed file systems - design issues - Case studies - The Sun Network File System-Coda.

Unit III**15 Hours**

Real time Operating Systems: Introduction - Applications of Real Time Systems - Basic Model of Real Time System - Characteristics - Safety and Reliability - Real Time Task Scheduling.

Unit IV**15 Hours**

Operating Systems for Hand held Systems: Requirements-Technology Overview- Handheld Operating Systems-Palm OS - Symbian Operating System - Android - Architecture of android Securing hand held systems.

Unit V**15 Hours**

Case Studies: Linux System: Introduction - Memory Management - Process Scheduling - Scheduling Policy - Managing I/O devices - Accessing Files- iOS: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

Learning Resources:**Text Books**

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2. Mukesh Singhal and Niranjana G. Shivaratri, “Advanced Concepts in Operating Systems -Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.

References

1. Rajib Mall, “Real -Time Systems: Theory and Practice”, Pearson Education India,2006.
2. Pramod Chandra P.Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3. Daniel. P. Bovet & Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005.

Websites/e-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2. <https://www.udacity.com/course/advanced-operating-systems--ud189>

3. <https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	3	3	3	2	1	2	2
CO2	3	3	3	2	2	3	3	2	3	2
CO3	3	2	3	3	3	3	3	2	3	3
CO4	2	2	3	3	3	2	3	3	3	2
CO5	2	3	2	2	2	3	2	2	3	3
Total	13	12	14	13	13	14	13	10	14	12
Average	2.6	2.4	2.8	2.6	2.6	2.8	2.6	2	2.8	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours /Wk.	Credits
24PCS4502	Artificial Intelligence and Machine Learning (T)	DSE	6	5

The course aims at enabling the students to design and analyze various machine learning algorithms and techniques focusing on recent advances. It also enables them to explore paradigms of machine learning, deep learning techniques and various feature extraction strategies.

Course Outcomes:

At the end of the course, student will be able to

CO1: demonstrate AI problems and techniques.

CO2: apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: explain machine learning concepts.

CO4: describe the components of a neural network: neurons, layers, weights, biases, activation functions, etc.

CO5: implement backpropagation algorithm to compute gradients and update weights in deep neural networks.

Unit I

18 Hours

Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search - Heuristic Search techniques: Generate and Test - Hill Climbing - Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis.

Unit II

18 Hours

Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations - Issues in Knowledge representations - Frame Problem - Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative

knowledge- Logic programming- Forward Vs Backward reasoning - Matching - Control knowledge.

Unit III

18 Hours

Introduction - Machine Learning Vs Traditional Computer Programming - Types of Machine Learning - Process of Machine Learning - Evaluating the model - Model Representation and Interpretability - Concept of loss functions - Major Limitations of Machine Learning.

Unit IV

18 Hours

Fundamentals of Neural Network: Introduction - Understanding the Biological Neuron - Exploring the Artificial Neuron - Types of Activation Functions - Architectures of Neural Network - Learning Process in ANN - Deep Neural Network.

Unit V

18 Hours

Introduction - Mathematics Behind Back propagation - Deep L-layer Neural Network - Understanding the Notion of Forward and Backward Propagation in Perspective of Computation Graph - Initializing Weights in Neural Network - Batch, Mini-batch and Stochastic Gradient Descent - Regularization - Normalization of Inputs.

Learning Resources:

Text Books

1. Elaine Richand Kevin Knight, "Artificial Intelligence", Tata Mcgraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2. Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra &Amlan Chakrabarti, "Deep Learning", Pearson India Education Services India Pvt. Ltd., India. 2021.

References

1. George FLuger, "Artificial Intelligence", 4thEdition, Pearson Education Publ,2002.
2. Judith Hurwitz, Daniel Kirsch, "Machine Learning for Dummies®", IBM Limited Edition.

Websites/e-Learning Resources

1. <https://www.javatpoint.com/artificial-intelligenc-tutorial>

2. <https://pythonprogramming.net/machine-learning-tutorials/>
3. <https://nptcl.ac.in/courses/106/105/106105077/>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	2	2	2	2	2	1	2	1
CO2	3	2	3	2	2	2	2	1	2	2
CO3	3	3	3	2	2	3	2	1	2	2
CO4	3	3	3	3	3	3	2	1	1	2
CO5	3	3	3	3	3	3	2	1	1	2
Total	15	13	14	12	12	13	10	5	8	9
Average	3	2.6	2.8	2.4	2.4	2.6	2	1	1.6	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4504	Android Programming (TcL)	DSE	6	5

This course enables the students to understand android SDK. It helps students to acquire basic knowledge on Android application development. It gives practical knowledge to develop and deploy android applications.

Course Outcomes:

At the end of the course, the student will be able to

CO1: demonstrate proficiency in using Android Studio IDE.

CO2: design responsive and intuitive user interfaces using layouts, menus, and dialogs.

CO3: embed graphics and animation in developing android applications.

CO4: explain the role of content providers and intent filters in Android architecture.

CO5: demonstrate proficiency in creating and managing SQLite databases.

Unit I

18 Hours

The First App: Java and Android - The development environment- Android app - Our first Android app. Designing Layouts: Exploring Android UI design, Real world Layouts. Introducing Android Software Development Platform: The directory structure of an Android Project- Leveraging Android XML.

Unit II

18 Hours

Screen Layout Design: Views and Layouts: Android view hierarchies - Defining Screen Layouts: Using XML. UI Design: Buttons, Menus and Dialogs: Using Android UI elements (widgets)-Using Menus in Android - Adding Dialogs.

Unit III

18 Hours

An Introduction to Graphics Resources in Android: Introducing the Drawables - Using Bitmap images - Creating Animation. Adding Interactivity: Handling UI Events: An overview of UI events - Handling OnClick Events.

Unit IV**18 Hours**

Understanding Content Providers: An Overview- Defining a content provider - Working with a Database. Understanding Intents and Intent Filters: What is Intent? - Intent Resolution- Using Intents with Activities - Android Services - Using Intents with Broadcast Receivers.

Unit V**18 Hours**

The Android SQLite API - Upgrading SQLite - Adding Locations and Maps: Updating the database- Updating View Fragment - Adding location permissions Publishing Apps: Prepare to publish-Building the publishable APK file.

Learning Resources:**Text Books**

1. John Horton, 2018. Android Programming for Beginners, Packt Publishing, UK.
2. Wallace Jackson 2017. Android Apps for Absolute Beginners, Fourth Edition, APress, India.

References

1. Jerome DiMarzio, "Beginning Android Programming with Android Studio", 4thEdition, 2016.
2. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide", 2017.
3. Dixit Prasannakumar," Android", Vikas Publications, New Delhi, 2014, ISBN:9789325977884

Websites/ e-Learning Resources

1. <https://www.tutorialspoint.com/android>
2. <http://developer.android.com/guide/index.html>
3. <https://www.javatpoint.com/android-tutorial>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	2	2	2	2	2	2	2	1	2	1
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	3	3	2	2	2
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	14	12	13	12	11	13	13	9	10	9
Average	2.8	2.4	2.6	2.4	2.2	2.6	2.6	1.8	2	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4506	Compiler Design (T)	DSE	6	5

This course facilitates students in comprehending the diverse stages of compiler construction, ranging from parsing techniques to intermediate code generation and runtime environment. Upon completion, students will possess the capability to develop the front-end of compilers and construct code generators proficiently.

Course Outcomes:

At the end of the course, students will be able to:

CO1: characterize Loop Optimization and Directed Acyclic Graphs (DAGs) in source code analysis.

CO2: elucidate the data structures pertinent to Block Structured Languages.

CO3: implement a spectrum of parsing and transformation methodologies in compiler design.

CO4: scrutinize the intricacies of parsing techniques to grasp their underlying concepts.

CO5: assess the efficacy of Code Optimization strategies and techniques in code generation.

Unit I

18 Hours

Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens Finite automata - Regular expression to automata.

Unit II

18 Hours

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

Unit III

18 Hours

Semantic Analysis - Inherited and Synthesized attributes - Dependency graphs - Ordering the evaluation of attributes - S-attributed definitions - L-attributed

definitions - Applications of Syntax Directed translation - Syntax Directed translations schemes - Storage organization - Stack allocation of space.

Unit IV

18 Hours

Intermediate Code Generation - Variants of Syntax trees - Three Address code - Types and Declarations - Translation of Expressions - Type checking - Control flow - Back patching - Switch Statements - Procedure calls.

Unit V

18 Hours

Code Generation and Code Optimization - Issues in the design of a code generator - The target language - Address in the Target Code - Basic Block and Flow graphs - Optimization of Basic Blocks - A simple code generator - Peephole Optimization.

Learning Resources:

Text Book

1. Compilers Principles, Techniques and Tools, Alfred Aho, Ravi Sethi, Jeffrey D Ullman, 2nd Edition Pearson Education Asia.2015

References

1. "The Principles of Compiler Design", A.V. Aho and Jd Ullman Narosa Publishing House,2002.
2. Compiler Design, Godfrey Winster S. Aruna Devi, R Sujatha, Published by Yes Dee Publishing Pvt. Ltd, Third Reprint 2019.
3. Compiler Design, H. S. Mohan, Narosa Publishing House,2014
4. Compiler Design in R. Venkatesh and N. Uma Maheswari and S. Jeyanthi, Yes Dee Publishing Pvt Ltd,2015
5. Kenneth C. Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
6. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.

Websites/e-Learning Resources

1. [https://www.tutorialspoint.com/compiler_design/compiler_design_lexical_analysis.htm#:~:text=Lexical%20analysis%20is%20the%20first,comments%20in%20the%20source%20code\(Lexical Analysis\)](https://www.tutorialspoint.com/compiler_design/compiler_design_lexical_analysis.htm#:~:text=Lexical%20analysis%20is%20the%20first,comments%20in%20the%20source%20code(Lexical Analysis))
2. [https://www.geeksforgeeks.org/introduction-to-syntax-analysis-in-compiler-design/\(SyntaxAnalysis\)](https://www.geeksforgeeks.org/introduction-to-syntax-analysis-in-compiler-design/(SyntaxAnalysis))

3. [https://www.geeksforgeeks.org/semantic-analysis-in-compiler-design/\(Scmantic Analysis\)](https://www.geeksforgeeks.org/semantic-analysis-in-compiler-design/(Scmantic%20Analysis))
4. [https://www.slideshare.net/TasifTanzim/intermediate-code-generation-compiler-design\(Intermediate Code Generation\)](https://www.slideshare.net/TasifTanzim/intermediate-code-generation-compiler-design(Intermediate%20Code%20Generation))
5. [https://www.tutorialspoint.com/compiler_design/compiler_design_code_generation.htm\(Code Generation\)](https://www.tutorialspoint.com/compiler_design/compiler_design_code_generation.htm(Code%20Generation))

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	2	3	3	2	2	2	2
CO2	3	3	3	2	2	3	3	1	3	2
CO3	3	2	2	3	3	3	3	2	3	3
CO4	2	3	3	3	2	2	3	2	2	2
CO5	2	3	2	2	2	3	2	2	3	3
Total	13	14	13	12	12	14	13	9	13	12
Average	2.6	2.8	2.6	2.4	2.4	2.8	2.6	1.8	2.6	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS4304	Introduction to Artificial Intelligence (TeL)	GE	4	3

This course introduces the basic concepts and techniques of Artificial Intelligence (AI) along with the foundations of AI. At the end of course, students will be able to implement applications using python.

Course Outcomes:

At the end of the course, students will be able to

CO1: apply the various characteristics and concepts of Artificial Intelligence.

CO2: gain an understanding of how AI is changing the world of work.

CO3: implement and evaluate simple machine learning algorithms using appropriate libraries.

CO4: load, clean, transform, merge and reshape data using Pandas.

CO5: visualize data using Pandas and matplotlib libraries.

Unit

12 Hours

Introduction to Artificial Intelligence - Components of AI Program - Foundations of AI - Sub-areas of AI - Applications of AI - Current trends in AI - Introduction to AI related fields like Natural Language Processing(NLP), Expert Systems, Computer Vision, Robotics and speech recognition.

Unit II

12 Hours

Case studies and real-world applications of AI tools - AI tools introduction - What are AI Tools - Types of AI Tools - Applications of AI Tools.

Unit III

12 Hours

Introduction to Machine Learning: Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning - Classification problems - Regression problems - Clustering problems - Introduction to neural networks and deep learning.

Unit IV**12 Hours**

Introduction to Programming: Problem solving strategies; Structure of a Python program - Syntax and semantics - Executing simple programs in Python - Identifiers and keywords- Literals, and strings -Operators- Expressions-Input/output statements - Defining functions - Control structures, Mutable and immutable objects - Strings, List, Tuples, sets, dictionaries and their operations.

Unit V**12 Hours**

Data Structures in Pandas: Series, DataFrame, Index objects - Loading data into Pandas data frame - Handling missing data - Data wrangling: Data cleaning, transforming, merging and reshaping - Using matplotlib to plot data - Plotting functions in Pandas: Line, bar, Scatter plots, histograms, stacked bars, Heatmap.

Learning Resources:**Text Books**

1. Russell, Stuart, and Peter Norvig. "Artificial intelligence: a modern approach." (2002).
2. Balaguruswamy E., Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018.
3. McKinney W. Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media, 2018.

References

1. Taneja, S., Kumar, N., Python Programming- A modular Approach, Pearson Education India, 2018.
2. Molin S. Hands-On Data Analysis with Pandas, Packt Publishing, 2019.

Websites/e-Learning Resources

1. <https://www.javatpoint.com/artificial-intelligence-tutorial>
2. <https://pythonprogramming.net/machine-learning-tutorials/>
3. <https://nptel.ac.in/courses/106/105/106105077/>

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C01	2	2	2	2	2	2	2	2	1	1
C02	3	2	2	2	2	2	2	2	1	1
C03	3	3	3	2	3	2	2	1	1	2
C04	3	3	3	3	3	3	2	1	1	2
C05	3	3	3	3	3	3	2	1	1	2
Total	14	13	13	12	13	12	10	7	5	8
Average	2.8	2.6	2.6	2.4	2.6	2.4	2	1.4	1	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS4306	Documentation Using Latex (TcL)	GE	4	3

The course aims at introducing a software that is being widely used for typesetting especially in the Mathematics field for students. To make students know the importance of this software for publishing research articles, papers, project reports and books.

Course Outcomes:

At the end of the course, students will be able to

CO1: prepare a Latex document, to make scientific articles and project reports.

CO2: include figures and tables in a Latex document.

CO3: make conference proceedings and presentations.

CO4: use the preamble of the LaTeX file to define document class and layout options.

CO5: use BibTeX to maintain bibliographic information and to generate a bibliography for a particular document.

Unit I

12 Hours

Installation of LaTeX: Installation of Kile and MikeTeX - Class and packages - Latex programming and commands, sample packages - Beginning typesetting using LaTeX: Basics: What is LaTeX - Basics for document structuring - preamble preparation - saving a folder.

Unit II

12 Hours

Formatting of output document: Latex commands for font colour - font size - make title -begin document - new page - sectioning.

Unit III

12 Hours

Mathematical formulae: Insert mathematical symbols and Formulas - Tables and Figures: Creating Tables - Inserting figures - enumeration list - itemized list - font effects - inserting equations - Add references to figures and tables in text.

Unit IV**12 Hours**

Drawing with LaTeX: Picture environments - extended pictures - other drawing packages - Preparing book, project report in LaTeX.

Unit V**12 Hours**

Reference and Citation: Inserting references - Manual reference - Reference using BibTex - citing reference.

Learning Resources:**Text Books**

1. Learning Latex, D.F.Griffits, D.J.Higham, Siam, Philadelphia, 1997
2. Guide to LATEX, fourth edition, Helmut Kopka, PatrickW.Daly

References

1. Latex for beginners Workbook 5th edition, Document Reference:3722-2014, March 2014
2. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL,2011.
3. L. Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994.

Websites/e-Learning Resources

1. <https://www.tutorialspoint.com/latex-for-everyone-and-everything/index.asp>
2. <https://www.javatpoint.com/latex>
3. <https://latex-tutorial.com/>

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	3	2	2	1	1
CO2	2	2	2	2	2	3	2	2	1	1
CO3	2	3	2	2	2	3	3	2	1	2
CO4	3	3	2	3	3	3	3	2	1	2
CO5	3	3	2	3	3	3	3	2	1	2
Total	12	13	10	12	12	15	13	10	5	8
Average	2.4	2.6	2	2.4	2.4	3	2.6	2	1	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5401	Data Mining and Warehousing (T)	Core	5	4

This course aims the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.

Course Outcomes:

At the end of the course the student will be able to:

CO1: explain the basic data mining techniques and algorithms.

CO2: discuss the association rules, clustering techniques and data warehousing contents.

CO3: apply and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.

CO4: examine data warehouse with dimensional modelling and apply OLAP operations.

CO5: apply appropriate data mining algorithms to solve real world problems.

Unit I

15 Hours

Basic Data Mining Tasks- data mining versus knowledge discovery in databases- data mining issues- data mining metrics- social implications of data mining - data mining from a database perspective. Data mining techniques: Introduction- a statistical perspective on data mining- similarity- measures- decision trees- neural networks- genetic algorithms.

Unit II

15 Hours

Classification- Introduction -Statistical -based algorithms -distance based algorithms- decision tree-based algorithms-neural network-based algorithms-rule-based algorithms-combining techniques.

Unit III

15 Hours

Clustering-Introduction- Similarity and Distance Measures- Outliers- Hierarchical Algorithms- Partitional Algorithms. Association rules: Introduction - large item sets - basic algorithms -parallel & distributed algorithms- comparing approaches-

incremental rules- advanced association rules techniques -measuring the quality of rules.

Unit IV

15 Hours

Data warehousing-Introduction- characteristics of a data warehouse- data marts- other aspects of data mart. Online analytical processing: introduction - OLTP & OLAP systems. Data modelling -star schema for multidimensional view - data modelling - multifact star schema or snow flake schema - OLAP TOOLS - State of the market - OLAP TOOLS and the internet.

Unit V

15 Hours

Developing a data warehouse- why and how to build a data warehouse -data warehouse architectural strategies and organization issues - design consideration - data content - metadata distribution of data - tools for data warehousing - performance considerations - crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data warehouses - other areas for data warehousing and data mining.

Learning Resources:

Text Books

1. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson education, 2003.
2. C.S.R. Prabhu, “Data Warehousing Concepts, Techniques, Products and Applications”, PHI, Second Edition.

References

1. Arun K.Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd.,2003.
2. Alex Berson, Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001.
3. Jiawei Han & Micheline Kamber, Academic press. “Data Mining Concepts & Techniques”, 2001.

Websites/e-Learning Resources

1. <https://scikit-learn.org/stable/modules/tree.html>
2. <https://www.cloudflarc.com/larning/ai/what-is-neural-network/>

3. <https://www.btechguru.com/training-it--database-management-systems--file-structures--introduction-to-data-warchousing-and-olap-2-vidco-lccture--12054--26--151.html>
4. <https://zircon.tech/blog/olap-online-analytical-processing-tools/>
5. <https://datawarehouseinfo.com/data-warehouse/applications-of-a-data-warehouse/>

CO/ PSO	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	2	2	3	3	2	2	2	2
CO2	2	3	3	3	3	3	2	2	1	2
CO3	3	2	3	2	2	3	2	2	2	2
CO4	3	3	2	3	3	2	2	2	2	2
CO5	2	3	3	3	3	3	1	2	3	2
Total	13	13	13	13	14	14	9	10	10	10
Average	2.6	2.6	2.6	2.6	2.8	2.8	1.8	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5403	Advanced Database Management System (T)	Core	5	4

This course enables the students to provide strong foundation for database design and application development, and understand the underlying core database concepts and emerging database technologies.

Course Outcomes:

At the end of the course the student will be able to:

CO1: explain the various database components, models and DBMS architecture.

CO2: examine the use of normalization and functional dependency for database design.

CO3: construct advanced SQL queries on data and apply Procedural abilities through PL/SQL.

CO4: demonstrate the detailed architecture and performance tune of document-oriented NoSQL databases.

CO5: apply development tools on different types of NoSQL Databases.

Unit I

15 Hours

High-Level Conceptual Data Models for Database Design - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - ER Diagrams, Naming Conventions, and Design Issues - Relationship Types of Degree Higher than Two - Subclasses, Super classes, and Inheritance - Enhanced Entity Relationship Model -Relational Database Design by ER- and EER-to-Relational Mapping - Role of Information Systems in Organizations - Database Design and Implementation Process

Unit II

15 Hours

Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary-Keys - Second and Third Normal Forms - Boyce- Codd Normal Form - Multivalued Dependency and Fourth Normal Form - Join Dependencies and Fifth Normal Form - Inference Rules, Equivalence and Minimal Cover - Properties of Relational Decompositions - Nulls and Dangling Tuples - File Organization -

Organization of Records in Files - Ordered Indices - B+ Tree Index Files - Static Hashing- Bitmap Indices.

Unit III

15 Hours

PL/SQL Block Structure - Identifiers - Literals - Comments - Conditional and Sequential Control -Iterative Processing with Loops - Exception Handlers - Data Retrieval with Cursors - Procedures, Functions, and Parameters - Packages.

Unit IV

15 Hours

Introduction - Documents and Collections - Data Types - Create, Read, Update and Delete Operations -Querying using Find - Query Criteria - Type-Specific Queries - Where Queries

Unit V

15 Hours

Mobile databases- Multimedia Databases- Geographic Information Systems - Genome Databases.

Learning Resources:

Text Book

1. Elmasri, Navathe, Fundamentals of database systems, Pearson, Sixth Edition, 2014.

References

1. Korth, Sudershan, Database System Concepts, McGraw Hill, Sixth Edition, 2013.
2. Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly, Second Edition, 2013.
3. Steven Feuerstei, Oracle PL/SQL Programming, O'Reilly, Sixth Edition, 2014.

Websites/e-Learning Resources

1. <https://www.simplilearn.com/tutorials/sql-tutorial/er-diagram-in-dbms>
2. <https://www.scaler.com/topics/bcnf-in-dbms/>
3. https://4js.com/online_documentation/fjs-genero-manual-tutorial-html/index.html#genero-tutorial-topics/c_fgl_TutChap04_016.html
4. <https://www.gecksforgcecks.org/mongodb-database-collection-and-document/>

5. <https://www.scaler.com/topics/multimedia-database/>

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	3	3	3	2	1	2	2
CO2	3	2	3	3	3	3	2	2	1	2
CO3	3	3	3	3	3	3	2	1	2	2
CO4	2	3	3	3	3	2	2	1	2	2
CO5	3	3	3	3	3	3	2	2	3	2
Total	14	14	15	15	15	14	10	7	10	10
Average	2.8	2.8	3	3	3	2.8	2	1.4	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours /Wk.	Credits
24PCS5301	Advanced Database Management System Lab (L)	Core	4	3

This course enables the students to provide implementation of object oriented, parallel and partitioning concepts in RDBMS packages. This course also covers various queries in advanced databases like Neo4j and MongoDB.

List of Programs:

1. Create an employee table and perform Insertion, updation, deletion and set the following constraints. a) Primary b) Foreign Key c) Check d) Unique e) Null
2. Create an employee table and perform following join operation.
 - a) Self join b) Inner join c) Outer join d) Left join e) Right join
3. a) Create sales table with (sid, sname, sale_amount, sale_date) perform range partition with sales_date for (January February, March).
 - b) list and hash partitioning.
4. Create table employee (empno, dept, salary) and another table emp2 using the parallel query concepts.
5. Create a type address (street, city, state) as object and create table employee using the same type. Insert values and update the address of an employee.
6. Develop an application for Banking Management system using VB and My SQL.
7. Write queries in MongoDB to create student collection with id, name, course, percentage. another collection student2 with id, age, gender, address
 - a) Display all students coming from Coimbatore.
 - b) Display all students getting above 50 percent.
 - c) Display all female students coming from Erode.
 - d) Display all BSc students in descending order of their percentage.
 - e) Insert a sample of 5 users into the database with various profile details. Then, retrieve users with usernames starting with 'A'.
 - f) Update the email address of a specific user. Ensure that the change is reflected in the database.
 - g) Identify and delete users who have not logged in for more than six months.
8. Write a PL/SQL program to demonstrate Exceptions.

9. Write a PL/SQL program to demonstrate Cursors.
10. Write a PL/SQL program to demonstrate Functions.
11. Write a PL/SQL program to demonstrate Packages.
12. Write PL/SQL queries to create Procedures.
13. Write PL/SQL queries to create Triggers
14. Write queries in MongoDB to perform Querying and Filtering:
 - a) Retrieve products with a price between \$50 and \$100 in the "Electronics" category.
 - b) Retrieve posts created within the last 30 days and sort them by the creation date.
15. Write queries in MongoDB to perform Aggregation:
 - h) Calculate the average rating of products based on customer reviews using the aggregation framework.
 - i) Find the top 5 posts with the highest number of comments using the aggregation framework.
16. Write queries in MongoDB to create a student database
 - a) Create a backup of student database
 - b) Restore student database from the backup
17. Write basic Cypher queries in Neo4j for creating Node and Relationship:
 - a) Create two nodes representing users with properties like name and email.
 - b) Establish a friendship relationship between two users. Create a relationship type like FRIEND_OF.
 - c) Create nodes representing different cities with properties like name and population. Connect the users to the cities with a relationship type indicating their current residence.
18. Write basic Cypher queries in Neo4j for Retrieving Data Using MATCH, WHERE, and RETURN clauses.
 - a) To retrieve all nodes of a specific label (e.g., User). Return the names and email addresses of these users.
 - b) Retrieve the friendship relationships (FRIEND_OF) between users. Return the names of the users who are friends.
 - c) To find users who live in a specific city. Use the MATCH and WHERE clauses.
19. Create a node student with properties such as name, department, score and grade. use ORDER BY clause to perform the following:
 - a) Order nodes by using properties
 - b) Order nodes by using multiple properties

c) Order nodes in descending order.

Learning Resources:

Text Book

1. Elmasri, Navathe, Fundamentals of database systems, Pearson, Sixth Edition, 2014.

References

1. Korth, Sudershan, Database System Concepts, McGraw Hill, Sixth Edition, 2013.
2. Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly, Second Edition, 2013.
3. Steven Feuerstei, Oracle PL/SQL Programming, O'Reilly, Sixth Edition, 2014.

Websites/e-Learning Resources

1. <https://www.simplilearn.com/tutorials/sql-tutorial/er-diagram-in-dbms>
2. <https://www.scaler.com/topics/bcnf-in-dbms/>
3. https://4js.com/online_documentation/fjs-genero-manual-tutorial-html/index.html#genero-tutorial-topics/c_fgl_TutChap04_016.html
4. <https://www.gecksforggecks.org/mongodb-databasc-collection-and-document/>
5. <https://www.scaler.com/topics/multimedia-database/>

CO/ PSO	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	3	3	3	3	3	2	1	2	2
CO2	3	2	3	3	3	3	3	3	1	2
CO3	2	3	3	3	3	3	2	2	2	2
CO4	3	2	3	3	3	2	3	2	2	2
CO5	3	3	3	3	3	3	2	2	3	2
Total	14	13	15	15	15	14	12	10	10	10
Average	2.8	2.6	3	3	3	2.8	2.4	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5405	Digital Image Processing (TcL)	Core	5	4

This course aims the students to learn basic theory and algorithms that are widely used in Digital image processing.

Course Outcomes:

At the end of the course the student will be able to:

CO1: understand the fundamentals of Digital Image Processing.

CO2: understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement.

CO3: interpret image restoration and filtering.

CO4: apply the concepts of filtering and segmentation for digital image retrieval.

CO5: gain idea to process various image used in various fields such as weather forecasting,

Diagnosis of various disease using image such as tumour, cancer etc.

Unit I

15 Hours

Introduction- the origin of DIP - Examples of fields that use DIP - Fundamentals steps in DIP - Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception - Light and the electromagnetic spectrum - Image sensing and acquisition - Image sampling and Quantization - Some Basic relationship between Pixels - Linear & Nonlinear operations.

Unit II

15 Hours

Image Enhancement in the spatial domain- Background - some basic gray level Transformations -- Histogram Processing - Enhancement using Arithmetic / Logic operations - Basics of spatial -filtering - Smoothing spatial filters - Sharpening spatial filters - Combining spatial enhancement methods.

Unit III

15 Hours

Image Restoration: A model of the Image Degradation / Restoration Process - Noise models -Restoration is the process of noise only - Spatial Filtering - Periodic Noise reduction by frequency domain filtering - Linear, Portion - Invariant Degradations -

Estimating the degradation function - Inverse filtering - Minimum mean square Error Filtering - Constrained least squares filtering - Geometric mean filter - Geometric Transformations.

Unit IV

15 Hours

Image Compression: Fundamentals-Image compression models-Elements of Information Theory -Error Free compression - Lossy compression - Image compression standards.

Unit V

15 Hours

Image Segmentation: Detection and Discontinuities - Edge Linking and Boundary deduction -Thresholding - Region-Based segmentation - Segmentation by Morphological watersheds - The use of motion in segmentation.

Learning Resources:

Text Books

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.
2. B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003

References

1. Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004

Websites/e-Learning Resources

1. www.imageprocessingplace.com
2. <https://www.javatpoint.com/dip-image-transformations>
3. www.dynamsoft.com/blog/insights/image-processing/image-processing-101-colormodels/

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	2	2	2	2
CO2	3	2	3	3	3	3	3	2	1	3
CO3	2	3	3	3	3	3	2	3	2	2
CO4	3	3	2	3	3	3	3	2	3	3
CO5	3	3	3	3	3	2	3	1	3	2
Total	14	14	14	15	15	14	13	10	11	12
Average	2.8	2.8	2.8	3	3	2.8	2.6	2	2.2	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5407	Advanced Software Engineering (T)	Core	5	4

This course furnishes students with an all-encompassing grasp of software engineering principles, methodologies, and techniques, empowering them to craft top-tier software solutions aligning with stakeholder demands and prevailing industry benchmarks.

Course Outcomes:

At the end of the course, students will be able to

CO1: proficiently acquire, document, and validate software requirements.

CO2: efficiently oversee software projects, accounting for resources, risks, and quality.

CO3: develop software systems with modularity, cohesion, and comprehensive documentation.

CO4: execute structured software testing to ensure reliability and functionality.

CO5: recognize the significance of software upkeep and version management for sustained viability.

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Unit I

15 Hours

Introduction: The Problem Domain - Software Engineering Challenges - Software Engineering Approach - Software Processes: Software Process - Characteristics of a Software Process - Software Development Process Models - Other software processes.

Unit II

15 Hours

Software Requirements Analysis and Specification: Requirement engineering - Type of Requirements - Feasibility Studies - Requirements Elicitation - Requirement Analysis - Requirement Documentation - Requirement Validation - Requirement Management - SRS - Formal System Specification - Axiomatic Specification - Algebraic Specification - Case study: Student Result management system. Software Quality Management- Software Quality, Software Quality Management System, ISO 9000, SEI CMM.

Unit III**15 Hours**

Software Project Management: Responsibilities of a software project manager - Project planning - Metrics for Project size estimation - Project Estimation Techniques - Empirical Estimation Techniques - COCOMO - Halstead's software science - Staffing level estimation - Scheduling- Organization and Team Structures - Staffing - Risk management - Software Configuration Management - Miscellaneous Plan.

Unit IV**15 Hours**

Software Design: Outcome of a Design process - Characteristics of a good software design - Cohesion and coupling - Strategy of Design - Function Oriented Design - Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit V**15 Hours**

Software Testing: A Strategic approach to software testing - Terminologies - Functional testing- Structural testing - Levels of testing - Validation testing - Regression testing - Art of Debugging- Testing tools-Metrics-Reliability Estimation. Software Maintenance -Maintenance Process- Reverse Engineering- Software Re-engineering- Configuration Management Activities.

Learning Resources:**Text Books**

1. A Practitioners Approach - Software Engineering - R. S. Pressman, McGraw Hill.
2. An Integrated Approach to Software Engineering – PankajJalote, Narosa Publishing House, Delhi, 3rd Edition.

References

1. Software Engineering-K. K. Aggarwal and Yogesh Singh, New Age International Publishers, 3rd edition.
2. Fundamentals of Software Engineering - Rajib Mall, PHI Publication, 3rd Edition.
3. Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.

Websites/e-Learning Resources

1. <https://www.javatpoint.com/software-engineering-tutorial>
2. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs69/preview

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10
CO1	3	3	2	2	2	2	2	2	2	1
CO2	2	3	3	3	3	3	2	1	2	2
CO3	3	3	3	3	3	2	3	2	2	3
CO4	3	2	3	3	2	3	2	1	2	2
CO5	2	3	2	2	3	2	3	2	3	3
Total	13	14	13	13	13	12	12	8	11	11
Average	2.6	2.8	2.6	2.6	2.6	2.4	2.4	1.6	2.2	2.2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5409	Natural Language Processing (T)	DSE	6	4

This course enables the students to learn natural language processing and to learn how to apply basic algorithms in this field. It also helps to understand approaches to discourse, generation, dialogue and summarization within NLP.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: describe the fundamental concepts and techniques of natural language processing.

CO2: distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each techniques.

CO3: construct appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.

CO4: analyze large volume text data generated from a range of real-world applications.

CO5: develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.

Unit I

18 Hours

Natural Language Processing tasks in syntax, semantics, and pragmatics - Issue - Applications - The role of machine learning - Probability Basics - Information theory - Collocations - N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

Unit II

18 Hours

Word Level Analysis: Regular Expressions - Finite-State Automata - Morphological Parsing - Spelling Error Detection and correction - Words and Word classes - Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar - Constituency - Parsing - Probabilistic Parsing.

Unit III**18 Hours**

Meaning Representation - Lexical Semantics- Ambiguity - Word Sense Disambiguation. Discourse Processing: cohesion - Reference Resolution- Discourse Coherence and Structure.

Unit IV**18 Hours**

Architecture of NLG Systems - Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages - Machine Translation Approaches - Translation involving Indian Languages.

Unit V**18 Hours**

Information Retrieval: Design features of Information Retrieval Systems - Classical, Non-classical, Alternative Models of Information Retrieval - valuation Lexical Resources: WorldNet - Frame Net Stemmers - POS Tagger - Research Corpora SSAS.

Learning Resources:**Text Books**

1. Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.
2. Allen, James. Natural language understanding. Pearson, 1995.

References

1. Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog", Springer

Websites/e-Learning Resources

1. https://en.wikipedia.org/wiki/Natural_language_processing
2. <https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	2	2	3	3	3	2	1	2	2
CO2	2	2	3	3	3	3	3	1	1	3
CO3	3	3	3	3	3	3	2	1	2	2
CO4	3	3	3	3	3	3	3	1	3	3
CO5	3	3	3	3	3	2	3	1	3	2
Total	13	13	14	15	15	14	13	5	11	12
Average	2.6	2.6	2.8	3	3	2.8	2.6	1	2.2	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5411	Information Retrieval (T)	DSE	6	4

This course enables the students to perceive the concepts of document representation, document indexing, digital information storage, retrieval, and distribution.

Course Outcomes:

At the end of the course the student will be able to:

CO1: assess the basic techniques in Information Retrieval

CO2: discuss the structure of dictionaries, wildcard queries, memory indexing

CO3: build a document retrieval system for real-time document retrieval problems.

CO4: analyze about the XML retrieval,

CO5: distinguish about the Text classification and Naive Bayes

Unit I

18 Hours

Boolean retrieval: Information retrieval problem - Processing Boolean queries - Boolean model versus ranked retrieval. The term vocabulary and postings lists: Document delineation and character sequence decoding - Determining the vocabulary of terms - Faster postings list intersection via skip point.

Unit II

18 Hours

Dictionaries and tolerant retrieval: Search structures for dictionaries - Wildcard queries - Spelling correction - Phonetic correction. Index construction: Hardware basics - Blocked sort-based indexing -Single-pass in-memory indexing - Distributed indexing - Dynamic indexing.

Unit III

18 Hours

Scoring, term weighting and the vector space model: Parametric and zone indexes - Term frequency and weighting - The vector space model for scoring. Evaluation in information retrieval: Information retrieval system evaluation - Standard test collections - Evaluation of unranked retrieval sets -Evaluation of ranked retrieval results.

Unit IV**18 Hours**

XML retrieval: Basic XML concepts - Challenges in XML retrieval - A vector space model for XML retrieval - Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval.

Unit V**18 Hours**

Text classification and Naive Bayes: The text classification problem - Naive Bayes text classification - Properties of Naive Bayes - Feature selection - Evaluation of text classification.

Learning Resources:**Text Book**

1. Christopher D. Manning, Prabhakar Raghavan, Henrich Schutze “Introduction to Information Retrieval” Cambridge University Press, New York, 1st Edition

References

1. Stefan Buttcher et.al Information Retrieval - Implementing and Evaluating MIT Press 2012
2. David A. Grossman and Ophir Frieder Information Retrieval Universities Press, 2nd Edition, 2010

Websites/e-Learning Resources

1. <https://nlp.stanford.edu/IR-book/html/htmledition/an-example-information-retrieval-problem-1.html>
2. <https://prezi.com/smhwxymtvud/block-sort-based-indexing/>
3. <https://nlp.stanford.edu/IR-book/html/htmledition/challenges-in-xml-retrieval-1.html>
4. <https://nlp.stanford.edu/IR-book/html/htmledition/the-text-classification-problem-1.html>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	2	3	3	3	3	1	2	1
CO2	3	3	3	2	3	2	3	2	2	2
CO3	2	2	3	2	3	2	3	3	2	2
CO4	1	2	3	2	3	3	3	3	2	1
CO5	2	3	3	3	3	3	3	2	2	2
Total	10	13	14	12	15	13	15	10	10	8
Average	2	2.6	2.8	2.4	3	2.6	3	2	2	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5413	Cyber Security(T)	DSE	6	4

The course provides an exposure in learning the foundation of cyber security and to equip the students with the technical knowledge and skills needed to protect and defend against cyber threats.

Course Outcomes:

At the end of the course, the student should be able to

CO1: illustrates the basics of Cybercrimes and its classification.

CO2: classify various categories of Cybercrime and security threats occurring through the internet.

CO3: develops skills in using cryptographic techniques to secure our system.

CO4: familiarize in investigating DoS attacks and investigating crimes.

CO5: assess the traditional problems associated with computer crimes.

Unit I

18 Hours

Definition and origins -Cybercrime and information security - Cyber Criminals
Classifications of Cybercrime: Cybercrime against individuals, E- Mail Spoofing -
Spamming - Internet Time Theft-Industrial Spying - Hacking Online Frauds -
Pornographic offenses - software Piracy - Email bombing - password sniffing - credit
card frauds.

Unit II

18 Hours

Active and Passive attacks - Cyber stalking - types of stalkers - Botnets - Cloud
computing - Trends in mobility - Credit card frauds in mobile and wireless computing
- Types - Security challenges posed by mobile devices - Authentication service
security - Attacks on mobile/cell phones: Mobile phone theft - Mobile viruses -
Mishing - Vishing - Smishing- Hacking Bluetooth.

Unit III**18 Hours**

Cryptographic system - substitution techniques - Cacsar cipher - mono alphabetic ciphers - Hill ciphers. Transposition techniques - steganography - Data encryption standard - The strength of DES - Block Cipher Design principles.

Unit IV**18 Hours**

Investigating DoS Attacks: Types of DoS Attacks - Classification of DoS Attacks - Techniques to Detect DoS Attacks - Investigating DoS Attacks - Investigating Internet Crime: Introduction to Investigating Internet Crime - Steps for investigating Crime.

Unit V**18 Hours**

Clarification of terms - Traditional problems associated with computer crime - Introduction to Incident Response - Digital Forensics - Contemporary Crimes - Computers as Targets- Contaminants and Destruction of Data -Indian IT ACT 2000.

Learning Resources:**Text Books**

1. Nina Godbole and Sunit Belpure, Cyber Security understanding Cybercrimes, Computer Forensics and legal perspectives, Wiley, 2011.
2. William Stallings, Cryptography and Network security, Wiley, 2012.

References

1. Dr.Jeetendra Pande, 2017.Introduction to Cyber Security, Uttarakand Open University.
2. J.P.Mishra, 2012. An Introduction to Cyber Laws, Central Laws publications.

Websites/ e-Learning Resources

1. <https://www.geeksforgeeks.org/cyber-security-types-and-importance/>
2. <https://www.javatpoint.com/what-is-cyber-security>
3. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	2	3	2	2	2	1
CO2	2	3	2	2	3	3	3	3	2	2
CO3	3	2	3	3	3	3	3	3	3	2
CO4	2	2	3	3	3	3	2	2	3	2
CO5	2	1	2	2	3	3	3	3	1	1
Total	12	10	13	13	14	15	13	13	11	8
Average	2.4	2	2.6	2.6	2.8	3	2.6	2.6	2.2	1.6

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5233	Internship	Core	-	2

This course will allow a student to observe and participate in professional work environments and explore how his interests relate to possible careers. They are important learning opportunities through industry exposure and practices.

Course Outcomes:

At the end of the course, the student will be able to

CO1: identify how the internship relates to their academic courses and preferred career path.

CO2: integrate existing and new technical knowledge for industrial application.

CO3: design solutions to real time complex engineering problems using the concepts of Computer Science through independent study.

CO4: demonstrate teamwork and leadership skills with professional ethics.

CO5: prepare an internship report in the prescribed format and demonstrate oral communication through presentation of the internship work.

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	2	2	2	2	2	2	2
CO2	3	3	3	2	2	3	2	2	2	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	3	3	3	3	3	2	2	2	2
CO5	3	3	3	3	3	3	2	2	2	2
Total	15	14	15	13	13	14	10	10	10	10
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5502	Data Analytics Using R (TcL)	Core	6	5

This course enables the students to gain knowledge about an introduction to R, statistical language and environment that also provides more flexible graphics capabilities than other popular statistical packages.

Course Outcomes:

At the end of the course, the student will be able to

CO1: gain knowledge on basics of R.

CO2: explain the control structures and coding standards of R programming.

CO3: describe the usage of R for graphics and modelling, write functions and use R in an efficient way.

CO4: demonstrate R scripts for performing data handling functions.

CO5: manipulate and Process Data in R. Also learn the usage of R for statistical programming and computation.

Unit I

18 Hours

Benefits of using R-Unique features of R-Exploring R-Install-Packages- Working with code editor-First R session-navigating the workspace R-objects-Atomic Vectors-Attributes Matrices-Arrays-Class-Lists-Data Frames--Loading and Saving data.

Unit II

18 Hours

Control Structures- If-else-For Loops-While Loops-Repeat-Next, Break, Functions, Symbol Binding-R Scoping Rules-Optimization-Coding Standards-Dates and Time-Loop Functions-lapply(), apply(), mapply(), tapply(), split- Debugging- Problem diagnosis-Reading Errors and Warnings-Reading error messages-Caring about warnings-Going Bug Hunting-Calculating the logit()- Knowing where an error comes from-Looking inside a function.

Unit III

18 Hours

Graphics-Basic plotting-Manipulating the plotting window-Advanced plotting using lattice library- Saving plots.

Unit IV**18 Hours**

Measuring Central Tendency- Measuring Variability- Covariance and Correlation- Measuring Symmetry- PCA. Model formulae and model options- Output and extraction from fitted models. Models considered: Linear regression: lm() - Logistic regression: glm() - Poisson regression: glm() - Survival analysis: Surv(), coxph() - Linear mixed models: lme().

Unit V**18 Hour**

Entering data in the R text editor- Using the Clipboard to copy and paste- Reading data in CSV files, Reading data from Excel- Working with other data types. Manipulating and Processing Data- Deciding on the Most Appropriate Data Structure, Creating Subsets of Data, Adding Calculated Fields to Data, Combining and Merging Data Sets, Sorting and Ordering Data, Traversing Data with the Apply Functions, Getting to Know the Formula Interface, Working with Tables.

Learning Resources:**Text Books**

1. Andrie De Vries, Joris Meys, R Programming for Dummies. ISBN 978-1-119-96284-7. John Wiley & Sons, 2012
2. Golemund, Forword, Hadley Wickham, Garrett, Hands-On Programming with R, O'Reilly Publishers. June 2014.

References

1. Robert I. Kabacoff, R in Action, Data Analysis and Graphics with R, ISBN: 9781935182399, August 2011.
2. Viswa Viswanathan, Shanthi Viswanathan, R Data Analysis Cookbook. ISBN 10: 1783989068, 2015.
3. Seema Acharya, Data Analytics using R, Mc Graw Hill Education (India), 2018, ISBN: 978-93-5260-524-8.

Websites/e-Learning Resources

1. <https://www.tutorialspoint.com/r/index.htm>
2. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	2	1	1	2
CO2	3	2	2	2	2	2	2	1	1	2
CO3	3	2	3	2	2	3	3	1	2	2
CO4	3	3	3	3	3	3	3	1	2	2
CO5	3	3	3	3	3	3	3	1	2	2
Total	15	12	13	12	12	13	13	5	8	10
Average	3	2.4	2.6	2.4	2.4	2.6	2.6	1	1.6	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5504	Network Security and Cryptography(T)	Core	6	5

This course equips students with a comprehensive understanding of cryptographic principles, security protocols, and mechanisms, enabling them to develop robust security solutions and mitigate cyber threats in various domains.

Course Outcomes:

At the end of the course, the student will be able to

CO1: proficiency in mastering cryptographic algorithms, encompassing symmetric and asymmetric key systems like DES, AES, RSA, and Diffie-Hellman, for fortified data handling.

CO2: comprehension of message authentication, digital signatures, and authentication protocols, ensuring the sanctity and genuineness of data.

CO3: implementation of network security practices, integrating authentication services and encryption techniques for fortified information exchange.

CO4: exploration of web security concepts such as SSL, SET, firewalls, and intrusion detection systems, bolstering security measures.

CO5: application of cryptographic algorithms in practical scenarios through case studies, including network forensics and novel security mechanisms.

Unit I

18 Hours

Introduction to Cryptography - Security Attacks - Security Services -Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction - DES - Triple DES - AES - IDEA - Blowfish - RC5.

Unit II

18 Hours

Public-key Cryptosystem: Introduction to Number Theory-RSA Algorithm-Key Management- Diffie-Hellman Key Exchange-Elliptic Curve Cryptography Message Authentication and Hash functions - Hash and Mac Algorithm - Digital Signatures and Authentication Protocol.

Unit III**18 Hours**

Network Security Practice: Authentication Applications-Kerberos-X.509 Authentication services and Encryption Techniques. E-mail Security - PGP - S / MIME - IP Security.

Unit IV**18 Hours**

Web Security- Secure Socket Layer- Secure Electronic Transaction. System Security- Intruders and Viruses - Firewalls- Password Security.

Unit V**18 Hours**

Case Study: Implementation of Cryptographic Algorithms - RSA - DSA - ECC (C/JAVA Programming) - Network Forensic - Security Audit - Other Security Mechanism: Introduction to: Stenography - Quantum Cryptography - Water Marking - DNA Cryptography.

Learning Resources:**Text Books**

1. William Stallings, "Network Security Essentials Applications and Standards", Pearson Education, 2014.
2. Bruce Schneir, "Applied Cryptography: Protocols, Algorithms and Source Code in C", CRC Press, 2017.

References

1. A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 2018.
2. AnkitFadia, "Network Security", Mac Millan, 2010.
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007, Reprint 2015.

Websites/e-Learning Resources

1. <https://www.tutorialspoint.com/cryptography/index.html>
2. <https://nptel.ac.in/courses/106/105/106105031>
3. <http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	2	2	2	3	3
CO2	2	3	3	2	3	2	2	3	2	2
CO3	3	2	3	3	3	3	2	3	2	2
CO4	3	2	2	3	3	3	2	3	2	2
CO5	2	3	3	2	2	3	3	2	3	3
Total	13	12	14	13	14	13	11	13	12	12
Average	2.6	2.4	2.8	2.6	2.8	2.6	2.2	2.6	2.4	2.4

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5402	Research Methodology (T)	Core	6	4

This course enables the students to understand the basics of how research problems are defined, research methods are adopted and/or developed, research is undertaken and how research results are communicated to the peers.

Course Outcomes:

At the end of the course, the student will be able to

CO1: understand the fundamental principles and concepts of research methodology.

CO2: critically evaluate research literature and assess the validity and reliability of research findings.

CO3: gain knowledge on data analysis techniques, including quantitative and qualitative methods.

CO4: demonstrate proficiency in designing research studies, including selecting appropriate methodologies, sampling techniques, and data collection methods.

CO5: communicate research findings effectively through written reports and oral presentations.

Unit I

18 Hours

Research Methodology - Defining research problem - selecting the problem - necessity of defining the problem - techniques involved in defining a problem- Ethics in Research.

Unit II

18 Hours

Research Design-Principles of experimental design Working with Literature Importance, finding literature, using your resources, managing the literature, keep track of references, using the literature, literature review On-line Searching: Database - SciFinder - Scopus - Science Direct - Searching research articles - Citation Index - Impact Factor - H-index etc.

Unit III

18 Hours

Research Data - Measurement of Scaling: Quantitative - Qualitative - Classification of Measure scales - Data Collection - Data Preparation.

Unit IV**18 Hours**

Statistics - Descriptive Statistics Measures of Central Tendency - Measures of Dispersion - Measure of Skewness - Kurtosis - Measure of Relationship Linear Regression Analysis: Dependent and Independent variables - Simple Linear Regression model.

Unit V**18 Hours**

Report Writing - Scientific Writing and Report Writing: Significance - Steps - Layout - Types - Mechanics and Precautions - Latex: Introduction - text - tables - figures - equations - citations - referencing - and templates (IEEE style) - paper writing for international journals - Writing scientific report.

Learning Resources:**Text Books**

1. C. R. Kothari, Research Methodology Methods and Techniques, 3rd. ed. New Delhi: New Age International Publishers, Reprint 2014.
2. Zina O'Leary, The Essential Guide of Doing Research, New Delhi: PHI, 2005.

References

1. J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th. ed. SAGE Publications, 2014.
2. Kumar, Research Methodology: A Step by Step Guide for Beginners, 3rd. ed. Indian: PE, 2010.
3. R.Prabhu, T. Raju, V. Krishnapriya, Research Methodology, 2018.

Websites/e-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc24_ge41/preview
2. <https://www.geeksforgeeks.org/introduction-to-research-methodology/>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	2	2	2	3	2	2	1	2	2
CO2	3	2	3	2	3	2	2	1	2	2
CO3	3	2	3	3	3	2	2	1	2	2
CO4	3	3	3	3	3	3	2	1	2	2
CO5	3	3	3	3	3	3	2	1	2	2
Total	14	12	14	13	15	12	10	5	10	10
Average	2.8	2.4	2.8	2.6	3	2.4	2	1	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5506	Project (L)	Core	6	5

This course aims to implement the acquired programming skills for solving real-time problems. This implements software engineering techniques to develop software projects in the industry. It enables the student to construct new software system imparting the learned theory and practical programming skills.

Course Outcomes:

At the end of the course, the student will be able to

CO1: identify and classify the basics of a real-world problem into software solutions.

CO2: compute and illustrate standard design and the necessary environment.

CO3: classify and plan the relationships among project scheduling and planning process.

CO4: assess and measure the software development and implementation process.

CO5: manage with the adoption and revise on the improvement of the developed software.

Conducting Project Viva-Voce Examination:

Internal Assessment:

There shall be six components that will be considered in assessing a project work with weightage as indicated.

1. Timely completion of assigned tasks as evidenced by team meeting minutes 20%.
2. Individual involvement, team work and adoption of industry work culture 10%.
3. Quality of project documentation (Precision, stylistics etc.,) 10%.
4. Achievement of project deliverables 20%.
5. Effective technical presentation of project work 10%.
6. Viva 30% Based on the above 6 components and internal mark 40 can be awarded.

External Assessment:

Dissertation/Project submitted at the end of second year shall be valued by two examiners Internal and External Examiners.

Viva-Voce Examination:

The board of examiners shall award 60 marks based on the following components.

1. Achievement of project deliverables - 20 Marks.
2. Effective technical presentation of project work - 20 Marks.
3. Project Viva - 20 Marks.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO1	3	2	3	2	2	2	2	2	2	2
CO2	3	3	3	2	2	3	2	2	2	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	3	3	3	3	3	2	2	2	2
CO5	3	3	3	3	3	3	2	2	2	2
Total	15	14	15	13	13	14	10	10	10	10
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5404	Computational Intelligence (T)	DSE	6	4

This course enables the students to understand and apply the concepts of Neural Network and its functions. It also helps to identify and understand the basics of AI and its search.

Course Outcomes:

At the end of the course, the student will be able to

CO1: describe the fundamentals of artificial intelligence concepts and searching techniques.

CO2: develop the fuzzy logic sets and membership function and defuzzification techniques.

CO3: assess the concepts of Neural Network and apply the learning techniques

CO4: explain the artificial neural networks and its applications.

CO5: analyze the concept of Genetic Algorithm and optimization problems using GAs.

Unit I

18 Hours

Problem formulation - AI Applications - Problems - State Space and Search - Production Systems - Breadth First and Depth First - Travelling Salesman Problem - Heuristic search techniques: Generate and Test - Types of Hill Climbing.

Unit II

18 Hours

Notion of fuzziness - Operations on fuzzy sets - T-norms and other aggregation operators - Basics of Approximate Reasoning - Compositional Rule of Inference - Fuzzy Rule Based Systems - Schemes of Fuzzification - Inferencing - Defuzzification - Fuzzy Clustering - fuzzy rule-based classifier.

Unit III

18 Hours

What is Neural Network - Learning rules and various activation functions - Single layer Perceptions - Back Propagation networks - Architecture of Back propagation (BP) Networks, Back propagation Learning - Variation of Standard Back propagation

Neural Network, Introduction to Associative Memory - Adaptive Resonance theory and Self Organizing Map - Recent Applications.

Unit IV

18 Hours

Fundamental Concepts - Basic Models of Artificial Neural Networks - Important Terminologies of ANNs - McCulloch-Pitts Neuron - Linear Separability -Hebb Network.

Unit V

18 Hours

Introduction - Biological Background - Genetic Algorithm Vs Traditional Algorithm - Basic Terminologies in Genetic Algorithm - Simple GA - General Genetic Algorithm - Operators in Genetic Algorithm.

Learning Resources:

Text Books

1. S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley India Pvt. Ltd.
2. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Pearson Education in Asia.
3. Rajasekaran, G. A. Vijayalakshmi, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications”, PHI.

References

1. F. Martin, Mcneill, and Ellen Thro, “Fuzzy Logic: A Practical Approach”, AP Professional, 2000. Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI.
2. Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI.

Websites/e-Learning Resources

1. <https://www.javatpoint.com/artificial-intelligence-tutorial>
2. <https://www.w3schools.com/ai/>

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	2	1	1	2
CO2	3	2	3	3	2	2	2	1	1	2
CO3	3	3	3	3	2	3	2	1	1	2
CO4	3	3	3	3	3	3	3	1	1	2
CO5	3	3	3	3	3	3	3	1	1	2
Total	15	13	14	14	12	13	12	5	5	10
Average	3	2.6	2.8	2.8	2.4	2.6	2.4	1	1	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24PCS5406	Internet of Things (T)	Core	6	4

The course aims to instill the knowledge of IoT devices, Tools and Methodology. In completion of this course the student will be able to implement applications for various fields by using their knowledge on IoT.

Course Outcomes:

At the end of the course, students will be able to

CO1: demonstrate the designs and levels of IoT.

CO2: identify and utilize Domain Specific IoTs.

CO3: discover IoT design methodology, Devices and End points.

CO4: interpret IoT design using case studies.

CO5: elaborate Data analytics for IoT and Tools for IoT

Unit I

18 Hours

Introduction - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates.

Unit II

18 Hours

Introduction - Home automation - Cities - Environment - Energy - Retail - Logistics - Agriculture - Industry - Health & Lifestyle - IoT and M2M: Introduction - M2M - Difference between IoT and M2M - SDN and NFV for IoT - Software Defined Networking-Network Function Virtualization.

Unit III

18 Hours

What is an IoT device- Exemplary Device: RaspberryPi-About the Board – Linux on RaspberryPi - RaspberryPi Interfaces - Programming RaspberryPi with Python - Other IoT devices.

Unit IV

18 Hours

Introduction - Home Automation - Smart Lighting - Home Intrusion Detection - Cities - Smart Parking - Environment - Weather Monitoring System - Weather Reporting

Bot - Air Pollution Monitoring - Forest Fire Detection - Agriculture - Smart Irrigation
- Productivity Applications.

Unit V**18 Hours**

Introduction-Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis-
Apache Oozie - Apache Spark - Apache Storm - Using Apache Storm for Real-time
data analysis. Tools for IoT: Introduction - Chef-Chef cases study - Puppet-Puppet
case study.

Learning Resources:**Text Book**

1. Arshdeep Bahga, Vijay Madiseti, “Internet of Things- A Hands- on Approach”, Universities Press (India) Private Limited, 2016.

References

1. Peter Waher, “Learning Internet of Things”, PACKT Publishing, 2015.
2. Cuno P fister, “Getting Started with the Internet of Things”, O’Rielly Publication.
3. Francis Da Costa, “Rethinking the Internet of Things - A Scalable Approach to Connecting Everything”, A press open publication, 2013 Edition.

Websites/e-Learning Resources

1. https://www.tutorialspoint.com/internet_of_things/index.htm
2. <https://www.edureka.co/blog/iot-tutorial/>
3. <https://www.youtube.com/watch?v=LlhmzVL5bm8&list=PL9ooVrP1hQOGc cfBbP5tJWZ1hv5sIUWJl>
4. https://www.tutorialspoint.com/internet_of_things/index.htm

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	3	3	2	3	2	2	2	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	15	12	13	13	12	15	12	10	10	10
Average	3	2.4	2.6	2.6	2.4	3	2.4	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5408	Block Chain Technology(T)	DSE	6	4

This course enables the students to understand the basics of Block chain technology, private and public Block chain, and smart contract. It also helps the students to explore various aspects of Block chain technology like application in various domains.

Course Outcomes:

At the end of the course, students will be able to

CO1: explain and explore the working of Block chain technology.

CO2: identify the security and privacy implications of block chain technology.

CO3: apply the learning of solidity to build de-centralized apps on Ethereum.

CO4: analyze the working of Smart Contracts and the working of Hyperledger.

CO5: assess the methods relevant for design, development and operation of block chain-based applications.

Unit I

18 Hours

Definition of Block chain - Block Chain Technology Mechanisms & Networks - Block chain Origins - Objective of Block Chain - Block Chain Challenges - Transactions and Blocks - P2P Systems - Keys as Identity - Digital Signatures, Hashing, and public key cryptosystems - private vs. public Block chain.

Unit II

18 Hours

Bitcoin Terminology- The Bitcoin Network - The Bitcoin Mining Process - Mining Developments - Bitcoin Wallets - Decentralization and Hard Forks - Ethereum Virtual Machine (EVM) - Merkle Tree- Double - Spend Problem - Block chain and Digital Currency- Transactional Blocks - Impact of Block Chain Technology on Cryptocurrency.

Unit III

18 Hours

Introduction to Ethereum - Consensus Mechanisms - Metamask Setup - Ethereum Accounts - Transactions - Receiving Ethers - Smart Contracts.

Unit IV**18 Hours**

Definition of Hyperledger - Distributed Ledger Technology & its Challenges - Hyperledger & Distributed Ledger Technology - Hyperledger Fabric - Hyperledger Composer - Solidity - Language of Smart Contracts - Installing Solidity & Ethereum Wallet - Basics of Solidity - Layout of a Solidity Source File & Structure of Smart Contracts - General Value Types.

Unit V**18 Hours**

Internet of Things - Medical Record Management System - Domain Name Service and Future of Block chain - Alt Coins

Learning Resources:**Text Books**

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016.
3. Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018.

References

1. Antonopoulos, Mastering Bitcoin, O'Reilly Publishing, 2014.
2. D. Drescher, Block chain Basics. A press, 2017.

Websites/e-Learning Resources

1. <https://nptel.ac.in/courses/106/104/106104220/#>
2. <https://www.udemy.com/course/build-your-blockchain-az/>
3. <https://eduxlabs.com/courses/blockchain-technology-training/?tab=tab-curriculum>
4. <https://www.geeksforgeeks.org/consensus-algorithms-in-blockchain/>

CO/ PSO	PS O1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	2	1	2	2
CO2	3	2	2	2	2	2	2	1	2	2
CO3	3	3	3	3	3	3	2	1	2	2
CO4	3	3	3	3	3	3	2	1	2	2
CO5	3	3	3	3	3	3	2	1	2	2
Total	15	13	13	13	13	13	10	5	10	10
Average	3	2.6	2.6	2.6	2.6	2.6	2	1	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS5244	Professional Competency Skill (T)	SEC	-	2

This course is designed to cultivate student awareness about various competitive examinations, providing the necessary guidance to inspire and prepare them for potential careers in both the government and corporate sectors.

Course Outcomes:

At the end of the course, the student will be able to

CO1: develop a thorough understanding of the core subjects relevant to competitive examinations.

CO2: develop the ability to analyze complex situations, identify problems, and propose viable solutions.

CO3: demonstrate effective decision-making skills by considering various perspectives and potential outcomes.

CO4: develop effective networking skills to build and maintain professional relationships.

CO5: embrace the importance of lifelong learning and continuous professional development to stay current in the field.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	3	1	1	1	2
CO2	3	2	3	3	2	2	2	1	1	2
CO3	2	2	3	3	2	2	2	1	1	2
CO4	2	3	2	2	2	2	3	2	2	2
CO5	3	3	2	2	2	2	2	1	1	3
Total	13	13	12	12	10	11	10	6	6	11
Average	2.6	2.6	2.4	2.4	2	2.2	2	1.2	1.2	2.2

Strong – 3 Medium – 2 Low – 1

Department of Computer Science (PG)
Value Added Courses
w.e.f. 2024-2025

Sem	Course Code	Course Title	Hours/Wk.	Credits
2	24PCS422V	Animation through Blender	2	2
3	24PCS521V	Animation with Alice	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS422V	Animation through Blender	Value Added Course	2	2

This course will help the students to learn the skills 3D modelling, texturing and animation through blender is a course that can aid students create a 3D model and animate the same.

Course Outcomes:

At the end of the course, students will be able to

CO1: understand the basic concepts blender interface.

CO2: apply concepts of 3D tools.

CO3: enhance and create innovative characters.

CO4: collate sculpt modes, simulations blender modifier to develop new models.

CO5: create own 3D animated design.

Unit I:

6 Hours

Blender interface - curves - meshes - translation - rotation - scaling - 2D shapes in blender- Materials and textures.

Unit II:

6 Hours

Lighting and cameras: Light and shape - 3D geometrics - camera panel - lens - preview and lamp sub context - world setting.

Unit III:

6 Hours

Sculpt mode: tools - textures -retopology -Armatures: Bones management - layer system - pose mode - constraints - parenting organic or mechanical object -Blender particles: Smoke - fire static.

Unit IV:

6 Hours

Simulations: Rigid body simulation - smoke simulation - fluids simulation - cloth simulation.

Unit V:**6 Hours**

Animation -keyframe- timeline -framesblender modifier: array - bevel - curve - lattice, wave - multiple - Boolean - deform - mirror - skin - subdivision - build - rendering.

Learning Resources:**Text Book**

1. Gordon Fisher, Blender 3D basics, Packt publishing.

References

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling& Animation, CRC Press.
2. Christopher Kuhn, Blender 3D Incredible Machines, Packt Publishing.
3. Allan Britto, The beginners guide, 1st edition.
4. Oscar Beachler and Xury Greer, Packt publishing.

Web Resources

1. www.blender.org

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	2	1	2	1
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	3	3	2	2	2
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	14	12	13	12	11	13	13	9	10	9
Average	2.8	2.4	2.6	2.4	2.2	2.6	2.6	1.8	2	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24PCS521V	Animation with Alice	Value Added Course	2	2

This course enables the student will be able to learn Alice basic features. Students can create 3D animation using alice.

Course Outcomes:

At the end of the course, the student will be able to

CO1: understand working and familiarize Alice Basic features.

CO2: demonstrate object positioning and resizing using scene editor.

CO3: make use of conditional statements and looping for making a scene.

CO4: analyze event handling methods and techniques.

CO5: apply 3D text, billboards and sounds in Scene.

Unit I:

6 Hours

What is Alice- How to download and install Alice 3.1-A brief tour of the Alice 3 IDE
-A brief tour of the Menu Bar- How to Set Preferences -Touring the Gallery?

Unit II:

6 Hours

Adding an object to a scene-How to set object properties in the Scene editor- How to set special effects in a scene-Marking -How to position and resize an object in the Scene editor- Positioning sub-parts in Scene editor - How to align objects using a Snap grid- How to Cut, Copy, and Paste with the Clipboard.

Unit III:

6 Hours

Sequential & Parallel Execution - Do in order - Do together - Further nesting -
Branching & Looping - Conditional execution - Relational Operators-Randomness-
Repetition - While loops – Lists.

Unit IV:

6 Hours

Interactive programming & event handling - Control of flow - Events- Event handling methods.

Unit V:**6 Hours**

Create 3D Text - Billboards- Creating a Sound- Adding a Sound - Posting on YouTube.

Learning Resources:**Text Book**

1. Joel Adams, " Alice 3 in Action: Computing Through Animation", Cengage Learning, 2014, ISBN: 9781133589228, 1133589227.

References

1. Wanda Dann, Stephen Charles Cooper, Randy Pausch, " Learning to Program with Alice", Pearson Publisher, 2009, ISBN:9780137154975, 0137154976.

Websites/e-Learning Resources

1. <https://www.alice.org/resources/exercise-and-project/tutorial-designing-an-animation/>
2. <https://programminginalice.wordpress.com/2011/11/04/tutorial-walking-animation-in-alice-2-2/>

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	2	1	2	1
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	3	3	2	2	2
CO4	3	3	3	3	2	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	14	12	13	12	11	13	13	9	10	9
Average	2.8	2.4	2.6	2.4	2.2	2.6	2.6	1.8	2	1.8

Strong – 3 Medium – 2 Low – 1