MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL – 624 102

M.Sc. COMPUTER SCIENCE

Syllabus
(With Effect from 2021)

DEPARTMENT OF COMPUTER SCIENCE

MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL

DEPARTMENT OF COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

(2021-2022 ONWARDS)

M.SC COMPUTER SCIENCE

1. About the Programme

M.Sc. in Computer Science is a two-year post-graduate programme with the objective to develop human resources with core competence in various thrust areas of Computer Science. The programme includes Software Engineering, System Development, Natural Computation, Mathematical Foundation, Data Analytics and Artificial Intelligence.

Other modules include programming, data analytics, software development, applied communications, network architecture, and database design. The coursework of the programme focuses on preparing students for innovation within major tech companies or entrepreneurship within startup ventures.

Students are provided with opportunities to develop and have core competency in the field of Computer Science and encourage them to make a mark in the much sought-after IT industry. Guest lectures, case studies and presentations are organized from time to time to give an insight into the latest development and happenings in the industry

2. Programme Educational Objectives (PEOs)

PEO1: To provide technology-oriented students with the knowledge and ability to develop creative solutions.
PEO2: To develop skills to learn new technology.
PEO3: To apply computer science theory and software development concepts to construct computing-based solutions.
PEO4: To design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications.

3. Eligibility: B.Sc. CS / B.C.A. / B.Sc. IT

4. General Guidelines for PG Programme

i. **Duration:** The programme shall extend through a period of 4 consecutive semesters and the duration of a semester shall normally be 90 days or 450 hours. Examinations shall be conducted at the end of each semester for the respective subjects.
ii. **Medium of Instruction:** English
iii. **Evaluation:** Evaluation of the candidates shall be through Internal Assessment and External Examination.

- **Evaluation Pattern**

Assessment / Examination	Theory		Practical	
	Min	Max	Min	Max
Internal	13	25	13	25
External	38	75	38	75

- Internal (Theory): Test (15) + Assignment (5) + Seminar/Quiz(5) = 25
- External Theory: 75

- **Question Paper Pattern for External examination for all course papers.**

Max. Marks: 75 **Time: 3 Hrs.**

S.No.	Part	Type	Marks
1	**A**	**10*1 Marks=10** Multiple Choice Questions (MCQs): 2 questions from each Unit	**10**
2	**B**	**5*4=20** Two questions from each Unit with Internal Choice (either / or)	**20**
3	**C**	**3*15=45** Open Choice: Any three questions out of 5: one question from each unit	**45**
Total Marks			**75**

*** Minimum credits required to pass: 90**

- **Project Report**

A student should select a topic for the Project Work at the end of the third semester itself and submit the Project Report at the end of the fourth semester. The Project Report shall not exceed 75 typed pages in Times New Roman font with 1.5 line space.

- **Project Evaluation**

There is a Viva Voce Examination for Project Work. The Guide and an External Examiner shall evaluate and conduct the Viva Voce Examination. The Project Work carries 100 marks (Internal: 25 Marks; External (Viva): 75 Marks).

5. Conversion of Marks to Grade Points and Letter Grade
(Performance in a Course/Paper)

Range of Marks	Grade Points	Letter Grade	Description
90 – 100	9.0 – 10.0	O	Outstanding
80-89	8.0 – 8.9	D+	Excellent
75-79	7.5 – 7.9	D	Distinction
70-74	7.0 – 7.4	A+	Very Good
60-69	6.0 – 6.9	A	Good
50-59	5.0 – 5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

6. Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students with 71% to 74% of attendance must apply for condonation in the Prescribed Form with prescribed fee. Students with 65% to 70% of attendance must apply for condonation in the Prescribed Form with the prescribed fee along with the Medical Certificate. Students with attendance lesser than 65% are not eligible to appear for the examination and they shall re-do the course with the prior permission of the Head of the Department, Principal and the Registrar of the University.

7. Maternity Leave

The student who avails maternity leave may be considered to appear for the examination with the approval of Staff i/c, Head of the Department, Controller of Examination and the Registrar.

8. Any Other Information

In addition to the above mentioned regulations, any other common regulations pertaining to the PG Programmes are also applicable for this Programme.

M.Sc. Computer Science Curriculum

SEMESTER- I								
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours**		**Int**	**Ext**	**Total**
				L	**P**			
1.	P21CST11	**Core-1**: Advanced JAVA Programming	4	5	-	25	75	100
2.	P21CST12	**Core-2**: Data Structures and Algorithms	4	5	-	25	75	100
3.	P21CST13	**Core-3**: Discrete Mathematical Structures	4	5	-	25	75	100
4.	P21CST14	**Core-4:** Compiler Design	4	5	-	25	75	100
5.	P21CSP11	**Core–5**: Advanced JAVA and Data Structures & Algorithms Lab	4	-	6	25	75	100
6.	P21CSS11	**Supportive Course I**: Computer Skills for Web Designing and Video Editing	2	-	4	25	75	100
	Sub Total		**22**	**30**				**600**
SEMESTER – II								
7	P21CST21	**Core-6**: Python Programming	4	4	-	25	75	100
8	P21CST22	**Core-7**: Cryptography and Network Security	4	4	-	25	75	100
9	P21CST23	**Core-8**: Distributed Operating System	4	4	-	25	75	100
10	P21CST24	**Coure-9**: NoSQL Databases	4	4	-	25	75	100
11	P21CSP22	**Core-10**: Python Programming & Operating System Lab	4	-	6	25	75	100
12	NME	**Non Major Elective – 1:**	4	-	6	25	75	100

13	P21CSS22	**Supportive Course – 2**: Web Programming	2	-	2	25	75	100
	Sub Total		**26**	**30**				**700**
SEMESTER – III								
14	P21CST31	**Core-11**: Digital Image Processing	4	4	-	25	75	100
15	P21CST32	**Core-12**: Cloud Computing	4	4	-	25	75	100
16	P21CST33	**Core-13**: Artificial Intelligence and Machine Learning Algorithms	4	4	-	25	75	100
17	P21CST34	**Core-14**: Internet of things	4	4	-	25	75	100
18	P21CSP33	**Core-15**: Image Processing Lab	4	-	6	25	75	100
19	P21CSP34	**Core-16**: R Programming Lab	4	-	6	25	75	100
20	P21WSS33	**Supportive Course – 3**: Women Empowerment	2	2	-	25	75	100
	Sub Total		**26**	**30**				**700**
SEMESTER – IV								
21	P21CSE411/ P21CSE412/ P21CSE413	**Elective – 1** 1. Object Oriented Analysis and Design 2. Computational Linguistics 3. Client Server Computing	4	4	-	25	75	100
22	P21CSE421/ P21CSE422/ P21CSE423/	**Elective – 2** 1. Big Data Analytics 2. Soft Computing 3. Wireless Sensor Networks	4	4	-	25	75	100
23	P21CSR41	**Core-17**: Project Work	8	-	22	25	75	100
	Sub Total		**16**	**30**				**300**
	Total		**90**	**120**				**2300**

Non-Major Elective

The candidates who have joined the PG Programme, can also undergo Non Major Elective offered by other Departments.

List of Non-Major Electives:

S.No.	Course code	Non Major Elective Course Name
1	P21CSN211	C Programming
2	P21CSN212	Photo Designing
3	P21CSN213	Big Data Analytics
4	P21CSN214	Digital Image Processing
5	P21CSN215	Mobile Computing
6	P21CSN216	Data Communication and Networking
7	P21CSN217	Cloud Computing

Additional Credit Courses

P21CSV11	Big Data Analytics Lab	I Semester – 2 Credits
P21CSI21	Internship	II Semester – 2 Credits
P21CSO31	MOOC	III Semester – 2 Credits
P21CSV42	Soft Computing Lab	IV Semester – 2 credits

Programme Outcomes (POs)

After completing M.Sc. Computer Science Program, the students will be able to:

PO1	To provide advanced and in-depth knowledge of computer science and its application
PO2	To prepare Post Graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.
PO3	To enable students pursue a professional career in Information and Communication
PO4	Technology in related industry, business and research.
PO5	To impart professional knowledge and practical skills to the students.
PO6	Apply computer science theory and software development concepts to construct computing-based solutions.

Programme Specific Outcomes (PSOs)

After completing M.Sc. Computer Science Program, the students will be able to:

PSO1	Have the knowledge in the areas like Artificial Intelligence, Web Services, Cloud Computing, Paradigm of Programming language, Design and Analysis of Algorithms, Database Technologies Advanced Operating System, Mobile Technologies, Software Project Management and core computing subjects. Choose to study any one subject among recent trends in IT provided in the optional subjects.
PSO2	Understand all dimensions of the concepts of software application and projects.
PSO3	Understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.
PSO4	Develop in-house applications in terms of projects.

SEMESTER -I

COURSE CODE	P21CST11	ADVANCED JAVA PROGRAMMING	L	T	P	C
CORE - I			5	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Course Objectives	• To Understand the Basic Programming Concepts of Java. • To know how to import user defined package, to create thread program and string methods • To learn about the Input/output and Networking package classes and methods • To learn about the Abstract Windowing Toolkit and Applet package classes and methods

UNIT I: Applets

Applet Fundamental – Applet Class – Applet Life Cycle – Developing An Applet Program-Passing Values Through Parameters - Graphics In An Applet – Event Handling.

UNIT II: **GUI Applications**

Graphical User Interface-Creating Windows-Dialog Boxes-Layout Managers- AWT Component Classes- Swing Component Classes-Event Handling-AWT graphics classes.

UNIT III: Networking

Basics Of Networking - Networking In Java - Socket Programming Using TCP/IP – Socket Programming Using UDP – URL And INET Address Classes. **Java Database Connectivity:** Types Of Drivers- JDBC Architecture- JDBC Classes And Interfaces-Basic Steps In Developing JDBC Applications-Creating a New Database And Table With JDBC.

UNIT IV: Servlets

Basics – Advantages Over Applets – Servlet Alternatives – Servlet Strengths - Servlet Architecture - Servlet Life Cycle - Generic Servlet- HTTP Servlet-Passing Parameters To Servlet – Server-Side Include – Cookies – Filters-Security Issues.

UNIT V: Java Server Pages

Overview – JSP and HTTP – JSP Engines – Working Of JSP – Anatomy of A JSP Page- JSP Syntax-Creating A Simple JSP Page-Components Of Java Server Pages – Implicit Objects – Client Side Validation Using JavaScript – Handling Request And Response.

Text Book(s):

1. Herbert Schildt, Java The Complete Reference, McGraw Hill Education, 10th Edition, New York, 2017

Reference Books:

2. Uttam K.Roy, Advanced Java Programming, Oxford University Press,2017.
3. Black Book, Core and Advanced Java, Dreamtech Press, 2017

Course Outcomes

CO1: Define the Applet fundamentals, GUI applications and AWT components. K1
CO2: Discuss about Networking in java and Java database connectivity. K2
CO3: Understand the concept of Servlets. K2
CO4: Understand the concepts JSP and HTTP. K3
CO5: Discuss about the Web programming on client side and server side. K4

MAPPING OF COs WITH POS AND PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	M	M	M	M	M	S	M	S
CO4	M	S	M	S	M	S	M	S	S	S
CO5	S	M	S	S	S	S	M	M	S	S

S – Strongly Correlating **M- Moderately Correlating** **W-Weakly Correlating**

COURSE CODE	P21CST12	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
CORE – II			5	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Objectives	• To introduce algorithm analysis framework for recursive and non-recursive algorithms • To acquire knowledge on ADTs such as List, Stack and Queue • To explore the binary trees and the priority queues with their applications • To learn the various hashing techniques and Set ADT

UNIT I: Trees

Heaps – Binary Search Trees – Selection Trees – Forests – representation of Disjoint Sets – Counting Binary Trees.

Graphs: The Graph Abstract Data type – Elementary Graph Operations – Minimum Cost Spanning Trees – Shortest Paths and Transitive Closure – Activity Networks.

UNIT II: Hashing:

Introduction – Static hashing – Dynamic hashing – Bloom filters. **Priority Queues**: Single and Double ended priority queues – Left Trees – Binomial Heaps - Fibonacci Heaps – Pairing Heaps – Symmetric Min – Max Heaps – Interval Heaps.

UNIT III: Efficient Binary Search trees:

Optimal Binary Search Trees – AVL Trees – Red – Black Trees – Splay Trees. **Multiway Search Trees:** m-way Search Trees – B –Trees – B^+-Trees.

UNIT IV: Dynamic Programming:

The General Method – Multistage graphs – All-pairs shortest paths – Single-source shortest paths – Optimal binary search trees – string editing – 0/1 knapsack–reliability design–The Travelling Sales person problem – flow shop scheduling.

Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

UNITV: Backtracking:

The General Method – The 8-Queens Problem – Sum of subsets –Graph coloring – Hamiltonian cycles–Knapsack problem. **Branch and Bound:** The Method – 0/1 Knapsack problem – Traveling Salesperson (*) – Efficiency considerations.

TEXT BOOK(S):

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C++, University Press (India) Private Limited, Second Edition, Reprinted, 2017.

2. Alfred V.Aho, John E.Hopcraft and Jeffrey D.Ullman, Data Structures and Algorithms, Pearson Education, Fourteenth Impression, 2013.

REFERENCE BOOK(S):

1. Timothy A.Budd, Classic Data Structures in C++, Addison Wesley Publishing Co., First Edition., 1994.
2. Timothy A.Budd, Data Structure and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, Addison Wesley Publishing Company, 1997.
3. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.
4. P.T.Rajan, Data Structures, A. Chitra, Vijay Nicol Imprints Pvt Ltd, McGraw Hill Education of India Pvt. Ltd., 2006.
5. S.Sridhar, Design and Analysis of Algorithms, Oxford University Press,2015
6. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms – University Press (India) Private Limited, Second Edition, Reprinted, 2017.

COURSE OUTCOMES

CO1: Describe the dynamicstructures–treesandgraphsanddiscusstheapplicationofthesestructures in finding simplified solutions - K1

CO2: Describe hash and priority queues and its application - K2

CO3: Implement binary search tree, balanced tree and multi–way indexed tree - K2

CO4: Solve problems using dynamic programming and apply traversal techniques of trees and graphs - K3

CO5: Analyze and solve problems using backtracking and branch-and-bound technique - K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	M	M	M	M	M	S	M	M
CO4	S	S	M	S	M	S	M	S	S	S
CO5	S	M	S	S	S	S	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST13	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	C
CORE - III			5	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To study features of mathematical logic and inference. • To understand the relations and functions • To learn the automata theory. • To gain knowledge on probability and graph.

UNIT–I: MATHEMATICAL LOGIC AND INFERENCE

Statements and Notations – Connectives – Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Bi-conditional – Well Formed Formulas Tautology – Equivalence of formulas – Duality of Law – Tautological Implications. The theory of inference for statement calculus – Validity using truth table – rules of inference– consistency of premises and indirect method of proof.

UNIT – II: RELATIONS AND FUNCTIONS

Cartesian product of Two Sets –Relations– Representation of Relation– Operations on relation– Equivalence Relation. Function and Operator – One to one, onto functions – Special Type of Functions.

UNIT – III: AUTOMATA THEORY

Introduction – Alphabet, Words, Free semi group, Languages – Regular Expressions, Regular Languages – Finite State Automata – Grammars – Finite state Machine – Turing machine.

UNIT–IV: PROBABILITY THEORY

Introduction – Sample space and Event – Finite Probability Space– Conditional Probability – Independent Events.

UNIT–V: GRAPH THEORY

Introduction – Data structures – Graph and multi graph Sub graph, Isomorphic and homeomorphism graphs – Path, connectivity – Bridges of Konigsberg, Traceable multigraph.

TEXT BOOKS:

1. J.P.Trembly, R.Manohar, Discrete Mathematical structures with applications to computer science, Tata McGraw Hill Publications, 1997.
2. Dr.M.K.Venkatraman, Dr.N.Sridhran, N.Chandrasekaran, Discrete Mathematics, The National Publishing Company, 2012.
3. Seymour Lipschutz, Mark Lipson, Discrete mathematics, Schaum's outlines, 2nd Edition., Tata McGraw Hill Edition, 7threprint, 2007.

REFERENCE BOOKS:

1. John EHopcroft, Jeffery D.Ullman, Introduction to Automata Theory, languages and computation, Narosa Publishing House, 2006.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2005.
3. Frank Harary, Graph theory, Narosa Publishing House.

COURSE OUTCOMES

CO1: Impart knowledge on mathematical logic and theory of inference K1
CO2: Understand the concept of sets, relations, functions and mapping. K2
CO3: Understand the concepts of Automata Theory, Regular expressions, NFA and Turing Machine K3
CO4: Understand the concept of Probability theory. K3
CO5: Understand the graph theory concepts and applications in computer science. K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	M	S	M	S	S	S
CO5	S	S	S	S	S	S	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST14	COMPILER DESIGN	L	T	P	C
CORE - IV			5	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To study features of Compilers and Translators. • To understand the lexical analyzer • To learn the LR AND SLR. • To gain knowledge on. Symbol and optimization

UNIT I: Introduction to Compilers:

Compilers and Translators-Why Do We Need Translators? - The Structure of a Compiler – Lexical Analysis – Syntax Analysis - Intermediate Code Generation – Optimization – Code Generation – Book Keeping – Error Handling – Compiler – Writing Tools – Getting started.

UNIT II: Lexical Analysis:

The role of the lexical analyzer-Simple approach to design of a lexical analyzer – Regular Expressions – Finite Automata –From regular expression to finite automata – Minimizing the number of states of a DFA-A language for specifying lexical analyzer - Implementing a lexical analyzer.

UNIT III: Semantic Analysis:

The Syntactic Specification of Programming Languages- Context free grammars -Derivation and Parse Trees – Parsers – Shift-reduce Parsing – Operator-precedence parsing – Top – down parsing – Predictive Parsers.

UNIT IV: Syntax Analysis:

LR parsers-The canonical collection of LR(0) items-constructing SLR parsing tables – constructing canonical LR parsing tables – constructing SLR parsing tables – constructing LALR parsing tables.

Syntax directed translation schemes – Implementation of syntax directed schemes – Intermediate Code - Parse Tree and Syntax Trees -Three Address code, quadruples, and triples – Translation of assignment statements.

UNIT V: Code Optimization Code Generation:

The contents of a symbol tables-Data structure for a symbol table-Representing Scope information. Code Optimization-The principal sources of optimization – Loop optimization – The DAG representation of basic blocks –Peep hole Optimization.

TEXTBOOK(S):

1. Principles of Compiler Design, Alfred V.Aho and Jeffrey D.Ullman, 25th Reprint, 2002.

REFERENCEBOOK(S):

1. C.Allen Compiler Designing, I. Holub Prentice Hall of India, 2003.
2. C.N.Fischer and R. J.LeBlanc, Crafting a compiler with C , Benjamin Cummings, 2003.
3. J.P.Bennet, Introduction to Compiler Techniques, Second Edition, Tata Mc. GrawHill,2003.

COURSE OUTCOMES

CO1**:** Describe the basics of Compiler Structure - K3

CO2: Analyze the functioning of Lexical Analyzer and implementation using Finite Automata - K2

CO3**:** Understand the role of Context Free Grammar and Parsing Techniques - K1

CO4**:** Analyze the working methodology of LR Parsers and Representation of Intermediate Code Generation Phase - K4

CO5**:** Discuss about the Data Structures used by Compiler, various Code Optimization Sources and apply the techniques - K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	**S**	**S**	**M**	**M**	**M**	**M**	**M**	**S**	**S**	**M**
CO2	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**M**	**M**	**M**	**M**	**S**	**M**	**M**
CO4	**S**	**S**	**M**	**S**	**M**	**S**	**M**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**M**	**S**	**S**

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSP11	ADVANCED JAVA PROGRAMMING & DATA STRUCTURES AND ALORITHMS LAB	L	T	P	C
CORE - V			-	-	6	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Course Objectives	• To Understand the Basic Programming Concepts of Java. • To implement the concepts of Threads, Graphical Features and Networking in JAVA programs • To implement the concepts of Servlets • To implement the concepts of Data Structures using C++ Programs

JAVA List:

1. Program to display life cycle of an applet
2. Program to display digital clock using applet
3. Program to display different graphical shapes in applet
4. Program to display graphical bar chart by passing parameters in applet
5. Write an Applet which will play two sound notes in a sequence continuously use the play() methods available in the applet class and the methods in the Audio clip interface.
6. Program to find factorial value of N using AWT high level event handling
7. Program to illustrate window closing using AWT low level event handling.
8. Program to illustrate TCP based network communication.
9. Program to illustrate UDP based network communication.
10. Program to find sum of digits using RMI
11. Program to find length of the given string using RMI
12. Write a program in JAVA to implement a Client/Server application using RMI.
13. Program using HTML/Java script to find length of the given string.
14. Program using HTML/Java script to find biggest element of an array
15. Program to compute factorial value of N using Generic Servlet
16. Program to compute factorial value of N using HTTP Servlet
17. Use JDBC connectivity and create Table, insert and update data.
18. Write a program in Java to create a Cookie and set the expiry time of the same.
19. Write a program in Java to create Servlet to count the number of visitors to a webpage.
20. Write a program in Java to create a form and validate a password using Servlet.
21. Develop a Java Bean to demonstrate the use of the same.
22. Write a program in Java to convert an image in RGB to a Grayscale image.
23. Develop Chat Server using JAVA.

Data Structures and Algorithm List:

1. Implementation of Stack
    a) Using Array
    b) Using Linked List
2. Implementation of Queue
    a) Using Array
    b) Using Linked List
3. Implementation of Heap Tree.
4. Implementation of Tree Traversal.
5. Implementation of BFS.
6. Implementation of DFS.
7. Implementation of Merge Sort using Divide and Conquer.
8. Implementation of Knapsack Problem using Dynamic Programming.
9. Implementation of Warshall's Algorithm using Dynamic Programming.
10. Implementation of Floyd's Algorithm using Dynamic Programming.
11. Implementation of Dijkstra's Algorithm using Greedy Technique.
12. Implementation of Prim's Algorithm using Greedy Technique.
13. Implementation of n-queens Problem using Backtracking.
14. Implementation of Assignment Problem using Branch and bound.

SEMESTER - II

COURSE CODE	P21CST21	PYTHON PROGRAMMING	L	T	P	C
CORE - VI			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To understand why Python is a useful scripting language for developers. • To learn how to design and program Python applications. • To learn how to use lists, tuples, and dictionaries in Python programs. • To learn how to identify Python object types.

UNIT I: Python Programming: An Introduction

IDLE an Interpreter for Python, Python Strings, Relational Operators, Logical Operators, Bitwise Operators, Variables and Assignment Statements, Keywords, Script Mode. **Functions -** Built-in Functions, Function Definition and Call, Importing User-defined Module**,** Assert Statement, Command Line Arguments. **Control Structures -** if Conditional Statement, Iteration (for and while Statements).

UNIT II: **Scope**

Objects and Object IDs, Scope of Objects and Names. **Strings:** Strings, String Processing Examples, Pattern Matching. **Mutable and Immutable Objects –** Lists, Sets, Tuples, Dictionary.

UNIT III : **Recursion**

Recursive Solutions for Problems on Numeric Data, Recursive Solutions for Problems on Strings, Recursive Solutions for Problems on Lists, Problem of Tower of Hanoi. **Files and Exceptions:** File Handling, Writing Structures to a File, Errors and Exceptions, Handling Exceptions Using try…except, File Processing Example.

UNIT IV: **Classes I**

Classes and Objects, Person: An Example of Class, Class as Abstract Data Type, Date Class. **Classes II -** Polymorphism, Encapsulation, Data Hiding, and Data Abstraction, Modifier and Accessor Methods, Static Method, Adding Methods Dynamically, Composition, Inheritance, Built-in Functions for Classes.

UNIT V: **Graphics**

2D Graphics, Animation – Bouncing Ball.

Applications of Python

- Collecting Information from Twitter, Sharing Data Using Sockets, Managing Databases using Structured Query Language (SQL), Developing Mobile Application for Android, Integrating Java with Python.

TEXT BOOK(S):

1. Sheetal Taneja, Naveen Kumar, Python Programming, a Modular Approach with Graphics, Database, Mobile, and Web Applications, Pearson Publication, 2018.

REFERENCE BOOK(S):

1. Reema Thareja, Python Programming, Oxford UniversityPress,2017
2. Lambert, Fundamentals of Python Programming, C engage Publications, 2017
3. E.Balagurusamy, Problem Solving using Python, McGraw Hill Education Ltd., 2017 CRC Press.
4. Dieter Uckelmann; Mark Harrison; Architecting the Internet of Things Florian Michahelles, (Eds.) Springer, 2011.
5. Oliver Hersent, David Boswarthick, Omar Elloumi, The Internet of Things, Key Applications and Protocols, Wiley, 2017

COURSE OUTCOMES

CO1: Describe the basic concepts of python programming, Functions and control structures - K2
CO2: Understand Strings, Mutable and immutable objects - K3
CO3: Understand Recursion and Files and exception - K2
CO4: Discuss classes, objects, polymorphism, encapsulation and inheritance - K3
CO5: Apply python for collecting information from twitter, sharing data using sockets, managing database, and mobile application for android - K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	M	S	M	S	S	S
CO5	S	S	S	S	S	S	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST22	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
CORE - VII			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To learn about the Number Theory • To Understand the basics of Cryptography • To Understand Hash Functions and Cryptography • To Know about Security Procedure and System Security .

UNIT – I: Introduction & Number Theory

Services, Mechanisms and attacks – the OSI security architecture - Network security model - Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm - Finite fields - Polynomial Arithmetic – Prime numbers-Fermat's and Euler's theorem - Testing for primality - The Chinese remainder theorem-Discrete logarithms.

UNIT – II: Block Ciphers & Public Key Cryptography

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES) - Triple DES – Blowfish - RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange - Elliptic curve arithmetic - Elliptic curve cryptography.

UNIT – III: Hash Functions and Digital Signatures

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal.

UNIT – IV: Security Practice & System Security

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT V: E-Mail, IP & Web Security

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IP Security: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

Text Book(s):

1. William Stallings, Cryptography and Network Security, 6 th Edition, Pearson Education, March, 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.

Reference Book(s):

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
3. Charles P Fleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI, 2002.
6. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Douglas R Simson "Cryptography – Theory and practice", First Edition, CRC Press, 1995.

COURSEOUTCOMES

CO1: Understand the Number Theory K1
CO2: Understand the basics of Cryptography K2
CO3: Understand Hash Functions and Cryptography K3
CO4: Understand Security Procedure and System Security K3
CO5: Understand the various Security Services K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	M	M	M	S	S	M
CO2	S	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	M	M	S	M	M
CO4	S	S	S	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST23	DISTRIBUTED OPERATING SYSTEM	L	T	P	C
CORE - VIII			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Objectives	• To study features of Distributed operating system. • To understand the communication of different hardware and software in distributed environment. • To learn the distributed resource management components. • To gain knowledge on modern operating system working principles.

UNIT - I: Introduction

Introduction – Operating System Definition – Functions of Operating System – Types of Advanced Operating System – Design Approaches – Synchronization Mechanisms – concepts of a Process – Critical Section Problem – Process Deadlock – Models of Deadlock – Conditions for Deadlock – System with single-unit requests, Consumable Resources , Reusable Resources.

UNIT - II: Distributed Operating Systems

Distributed Operating Systems: Introduction- Issues – Communication Primitives – Inherent Limitations –Lamport's Logical Clock, Vector Clock, Global State, Cuts – Termination Detection – Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport's Algorithm - Token Based Algorithms –Distributed Deadlock Detection – Distributed Deadlock Detection Algorithms – Agreement protocols.

UNIT - III Distributed Resource Management

Distributed Resource Management – Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed shared Memory – Architecture – Algorithm – Protocols – Design Issues – Distributed Scheduling – Issues – Components – Algorithms.

UNIT - IV Failure Recovery and Fault Tolerance

Failure Recovery and Fault Tolerance – Concepts – Failure Classifications – Approaches to Recovery – Recovery in Concurrent Systems – Synchronous and Asynchronous Check pointing and Recovery –Check pointing in Distributed Database Systems – Fault Tolerance Issues – Two-Phase and Non blocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols.

UNIT - V: Multiprocessor and Database OS

Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management – Reliability/Fault Tolerance – Database Operating Systems – concepts – Features of Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

Text Book(s):

1. Mukesh Singhal N.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 2000.
2. Andrew S.Tanenbaum, Distributed Operating System, PHI, 1994.

Reference Book(s):

1. Abraham Silberschatz, Peter B.Galvin, G.Gagne, "Operating Concepts", 6th Edition Addison Wesley publications, 2003.

2. Andrew S.Tanenbaum, "Modern Operating Systems", 2nd Edition Addison Wesley, 2001

COURSE OUTCOMES

CO1**:** Understand the Operating System Structure and its Services K1

CO2**:** Understand the efficient Scheduling of Multiple Process Execution. K2

CO3**:** Understand the efficient allocation of available memory among multiple processes K3

CO4**:** Understand the Device Management System K3

CO5**:** Compare and Contrast the features of Windows and LINUX operating Systems in terms of their services. K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	M	S	M	S	S	S
CO5	S	S	S	S	S	S	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST24	NoSQL DATABASES	L	T	P	C
CORE - IX			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Objectives	• Distinguish the different types of NoSQL databases • To learn the Database Terminology • To understand Document Database • To learn Column Family Database.

UNIT I Introduction

Database System Applications - View of Data - Database Languages - Relational Databases - Database Design - Data Storage and Querying - Transaction Management - Database Architecture - Data Mining and Information Retrieval - Specialty Databases - Database Users and Administrators - History of Database Systems.

Relational Databases: **Introduction to the Relational Model**: Structure of Relational Databases - Database Schema - Keys - Schema Diagrams - Relational Query Languages – Relational Operations.

UNIT II: Variety of NoSQL Databases

Data Management with Distributed Databases - ACID and BASE - Four Types of NoSQL Databases. **Key-Value Databases:** From Arrays to Key-Value Databases - Essential Features of Key-Value Databases - Keys: More Than Meaningless Identifiers.

Key-Value Database Terminology: Key-Value Database Modeling Terms - Key-Value Architecture Terms - Key-Value Implementation Terms.

UNIT III: Document Databases:

What is a Document - Avoid Explicit Schema Definitions - Basic Operations on Document Databases. **Document Database Terminology:** Document and Collection Terms - Types of Partitions - Data Modeling and Query Processing.

Designing for Document Databases: Normalization, Denormalization, and the Search for Proper Balance - Planning for Mutable Documents - The Goldilocks Zone of Indexes - Modeling Common Relations.

UNIT IV Family Databases

Column Family Databases: Google BigTable - Differences and Similarities to Key-Value and Document - Architectures Used in Column Family Databases - When to Use Column Family Databases.

Column Family Database Terminology: Basic Components of Column Family Databases - Structures and Processes: Implementing Column Family -Processes and Protocols.

Designing for Column Family Databases: Guidelines for DesigningTables-GuidelinesforIndexing-ToolsforWorkingwithBigData

UNIT V Graph Database

Graph Databases: What is a Graph - Graphs and Network Modeling - Advantages of Graph Databases. **Graph Database Terminology:** Elements of Graphs - Operations on Graphs - Properties of Graphs and Nodes - Types of Graphs.

Designing for Graph Databases: Getting Started with Graph Design - Querying a Graph - Tips and Traps of Graph Database Design.

BOOKS FOR STUDY:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "**Database System Concepts",** Sixth Edition, McGrawHill,2016.
   UNITI : Chapters: 1, 2
2. Dan Sullivan, Addison-Wesley, **"NoSQL for Mere Mortals",** Pearson India Education Services Pvt. Ltd.,2016.

BOOKS FOR REFERENCE:

1. SAMS, Brad Dayley, **"NoSQL with MongoDB in 24 Hours"**, Pearson Education, First Edition,2015.
2. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, **"MongoDB in Action",** Dreamtech Press, Second Edition,2017.

COURSE OUTCOMES

CO1: Acquire a deep knowledge on relational Database, Structured Query Language and Data Modeling K1
CO2**:** Acquire the Knowledge on MongoDB query language K2
CO3: Comprehend the principles of NoSQL K2
CO4: Differentiate NoSQL key value database and Document database K2
CO5: Know the concept of Column database and Understand the data modeling techniques K2

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	M	S	S	S	M	S	M	M	S
CO3	S	S	S	S	S	M	M	S	S	M
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	M	S	M	M	S	M	M	S	M

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSP22	CHOICE –I	L	T	P	C
CORE - X		PYTHON PROGRAMMING & OPERATING SYSTEM LAB	-	-	6	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Objectives	• To acquire programming skills in core Python. • To acquire Object Oriented Skills in Python • To develop the skill of designing Graphical user Interfaces in Python • To develop the ability to write database applications in Python

Exercise1-Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purpose fully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints it's sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2,1/3,1/4,...,1/10

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

e) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

f) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 4 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

c) Write a program combine_lists that combines these lists into a dictionary.

d) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 5 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 6 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. Hint: Represent a ball on a plane as a tupelo of(x,y,r), r being the radius
If(distance between two balls centers) <= (sum of the irradii) then(they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.
c) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
d) Write a function dups to find all duplicates in the list.
e) Write a function unique to find all the unique elements of a list.

Exercise - 7 - Functions - Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list without, using the reverse function.
c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

Exercise - 8 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 9 - Modules

a) Install packages requests, flask and explore them using(pip)
b) Write a script that imports requests and fetch content from the page. Eg.(Wiki)
c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise – 10 OOP

a) Class variables and instance variable and illustration of these lf variable
i) Robot
ii) ATM Machine

Exercise - 11 - Testing

a) Write a test-case to check the function even_numbers which return True on passing a list of all even numbers
b) Write a test- case to check the function reverse_string which returns the reversed string

Exercise - 12 - Advanced

a) Build any one classical data structure.
b) Write a program to solve Knapsack problem.

COURSE CODE	P21CSP22	CHOICE -II	L	T	P	C
CORE - X		OPERATING SYSTEM LAB	-	-	6	4

1: Simulate the following CPU scheduling algorithms.

a) FCFS b) SJF c) Round Robin d) Priority.

2: Write a C program to simulate producer-consumer problem using Semaphores

3: Write a C program to simulate the concept of Dining-philosophers problem.

4: Simulate MVT and MFT.

5: Write a C program to simulate the following contiguous memory allocation Techniques

a) Worst fit b) Best fit c) First fit.

6: Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL

7: Simulate all File Organization Techniques a) Single level directory b) Two level directory

8: Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.

9: Simulate Bankers Algorithm for Dead Lock Avoidance.

10: Simulate Bankers Algorithm for Dead Lock Prevention.

11: Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN

COURSE CODE	P21CSS22	WEB PROGRAMMING LAB	L	T	P	C
SUPPORTIVE COURSE II			2	-	-	2

1. Develop and demonstrate a XHTML file that includes Java Script for the following problems:

   a) Input: A number n obtained using prompt Output: The first n Fibonacci numbers

   b) Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert

2. a) Develop and demonstrate, using Java script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.

   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)

3. a) Develop and demonstrate, using Java script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.

   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.

4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.

b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

7. Write a Perl program to display a digital clock which displays the current time of the server.

8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.

10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.

12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings

Semester – III

COURSE CODE	P21CST31	DIGITAL IMAGE PROCESSING	L	T	P	C
CORE - XI			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To learn about the basic concepts of digital image processing and various image transforms. • To familiarize the student with the image enhancement techniques • To expose the student to a broad range of image processing techniques and their applications. • To appreciate the use of current technologies those are specific to image processing systems.

UNIT I: Introduction to Image Processing

Overview of Image Processing - Nature of Image Processing - Digital Image Representation-Types of Images-Based on Nature - Based on Attributes - Based on Colour - Based on Dimensions – Based on Data Types – Domain Specific Images – Digital Image Processing Operations – Fundamental Steps In Image Processing – Image Enhancement – Image Restoration - Image Compression - Image Analysis – Image Synthesis.

Digital Imaging Systems: Overview of Digital Imaging Systems –Image Sensors – Image Storage – Image processors – Output Devices –Networking Components – Image Processing Software – Physical Aspects of Image Acquisition-Nature of Light - Simple Image Model - Colour Fundamentals - Lighting System Design-Simple Image Formation Process - Biological Aspects of Image Acquisition – Human Visual System – Properties of Human Visual System – Monochrome and Colour Image – Review of Digital Cameras – Sampling and Quantization – Sampling – Resampling - Image Quantization - Image Display Devices and Device Resolution – Digital Halftone Process - Random Dithering - Ordered Dithering - Non - periodic Dithering – Image Storage and File Formats - Need for File Formats -Types of File Formats - Structures of File Formats.

UNIT II: Digital Image Processing Operations

Basic Relationships and Distance Metrics - Image Coordinate System - Image Topology - Connectivity-Relations-DistanceMeasures-ImportantImageCharacteristics-Classificationof Image Processing Operations - Arithmetic Operations. Logical Operations – Geometrical Operations - Image Interpolation Techniques - Set Operations.

Digital Image Transforms: Need for Image Transforms – Spatial Frequencies in Image Processing - Introduction to Fourier Transform – Discrete Fourier Transform – Fast Fourier Transform – Discrete Cosine Transform.

UNIT III: Image Enhancement

Image Quality and Need for Image Enhancement - Image Quality Factors - Image Quality Assessment Toll – Image Quality Metrics – Image Enhancement operations – Image Enhancement in Spatial Domain – Linear Point Transformations – Non – Linear Transformations – Square Function – Square root – Logarithmic Function – Exponential Function - Power Function - Gamma Correction - Histogram - Based techniques – Histogram Stretching – Histogram Sliding – Histogram Equalization – Histogram Specification – Local and Adaptive Contrast Enhancement – Spatial Filtering Concepts – Image Smoothing Spatial Filters

- Box Filters - Gaussian Filters - Image Sharpening Spatial Filters - Gradient and Laplacian Filters- High – boost Filters – Unsharp Masking.

Image Restoration: Introduction to Degradation - Types of Image Degradations - Image Degradation Model - Noise Modeling -Noise Categories Based on Distribution - Noise Categories Based on Correlation – Noise Categories Based on Nature – Noise Categories Based on Source- estimation by Observation Estimation by Experimentation - Estimation by Modeling - Image Restoration Techniques –Unconstrained Method – Inverse Filters – Wiener Filters.

UNIT IV: Image Compression

Image Compression Model - Compression-Measures – Compression Algorithm and its Types – Entropy Coding - Predictive Coding - Transform Coding - Layered Coding - Types of Redundancy - Coding Redundancy - Inter pixel Redundancy - Psycho visual Redundancy - Chromatic Redundancy - Lossless Compression Algorithms - Run - length Coding – Huffman Coding - Bit plane Coding - Arithmetic Coding - Dictionary - based Coding – Lossless Predictive Coding - Lossy Predictive Coding - Vector Quantization – Codebook design –Generalized Lloyd algorithm.

UNIT V: Image Segmentation:

Introduction – Formal Definition of Image Segmentation – Classification of Image Segmentation Algorithms - Detection of Discontinuities –Point Detection-Line Detection - Edge Detection - StagesinEdgeDetection-TypesofEdgedetectors-FirstorderEdgeDetection-Edgeoperatorperformance - Edge linking Algorithms - Principle of Thresholding - Principle of Region –growing. **Colour Image Processing -** Introduction - Colour Image Storage and Processing -Colour Models - RGB Colour Model - HIS Colour Model - HSV Colour Model - HLS Colour Model - Printing Colour Models - Colour Quantization - Popularity or Populosity Algorithm – Median cut Algorithm – Octree based Algorithm – Pseudo Colour Image Processing – Full colour Processing- Colour Transformations – Image Filters for Colour Image – Colour image Segmentation.

TEXT BOOK(S):

1. S.Sridhar, Digital Image Processing, Second Edition, OXFORD University Press, 2016.

REFERENCE BOOK(S):

1. Rafael C.Gonzalez, Richard E.Woods, Digital Image Processing using MATLAB, 2nd Edition, Prentice Hall of India, 2002.
2. A.Jain, Fundamentals of Digital Image Processing, Prentice Hall of India, 2010.
3. William K Pratt, Digital Image Processing, John Willey, 2002.

COURSE OUTCOMES

CO1: To impart the knowledge about image processing techniques and understand the concept of image analysis, storage formats of image K1

CO2: To analyze the attitude of image processing arithmetic operations and image transformation techniques. K2

CO3: Discuss about the image need for image enhancement and use of image restoration. K3

CO4: To understand the concept to fit image compression models, measures and algorithms. K3

CO5: Understand the role of image segmentation, various color models and color image transformation K4

MAPPING OF COs WITH POs AND PSOs

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	M	M	S	M	S	S	S
CO5	S	S	M	S	S	M	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST32	CLOUD COMPUTING	L	T	P	C
CORE - XII			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To learn the concepts of cloud computing, cloud services and platforms • To understand real – world cloud applications • To develop Cloud applications • Identify and define technical challenges for cloud applications and assess their importance.

UNIT I: Cloud Architecture and Model:
Technologies for Network-Based System – System Models for Distributed and Cloud Computing NIST Cloud Computing Reference Architecture. Cloud Models: Characteristics – Cloud Services – Cloud models(IaaS, PaaS, SaaS) – Public vs. Private Cloud – Cloud Solutions – Cloud ecosystem – Service management – Computing on demand.

UNIT II: Virtualization:
Basics of Virtualization - Types of Virtualization – Implementation Levels of Virtualization- Virtualization Structures – Tools and Mechanisms – Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-Center Automation.

UNIT III: Cloud Infrastructure:
Architectural Design of Compute and Storage Clouds –Layered Cloud Architecture Development – Design Challenges – Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV: Programming Model:
Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack, Aneka, Cloud - Sim.

UNITV: Security in the Cloud:
Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

TEXT BOOK(S):

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers,2012.

REFERENCE BOOK(S):

1. John W.Ritting house and James F.Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
2. Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, To by Velte,

TMH, 2009.

3. Kumar Saurabh, Cloud Computing – Insights into New – Era Infrastructure, Wiley India, 2011.
4. James E.Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.

COURSE OUTCOMES

CO1: Describe the Cloud Architecture and Model. K1

CO2: Analyze the basics and applications of Virtualization. K3

CO3: Understand the different Cloud Infrastructure. K2

CO4: Understand different programming model. K4

CO5: Discuss the Cloud Security Challenges and Risks. K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	M	S	M	S	M	S
CO5	S	S	S	S	S	S	M	M	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST33	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ALGORITHMS	L	T	P	C
CORE - XIII			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:** Analyze
Objectives	• To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements. To have an appreciation for the engineering issues underlying the design of AI systems. • To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language. • To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs. • To understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

UNIT I: Introduction:
Introduction to Artificial Intelligence, Intelligence Problems and AI techniques, Solving problems by searching, Problem Formulation. Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Uninformed Search Techniques: DFS, BFS, Uniform cost search,

UNIT II: Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. Informed Search Methods:
Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto Arithmetic Problem, Backtracking for CSP, Performance Evaluation. 6 Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning.

UNIT III: **Introduction to Machine Learning**: Introduction to Analytics and Machine Learning – Framework for developing Machine Learning Models – Probability Theory – Random Variables – Binomial Distribution – Poisson Distribution – Exponential Distribution – Normal Distribution – Central Limit Theorm – Hypothesis Test – Analysis of Variance (ANOVA).

UNIT IV: **Introduction to Linear Regression:**
Linear Regression – Steps in Building a Regression Model – Building Simple regression Model –Model Diagnostics – Multiple Linear Regression - Binary Logistic Regression – Credit Classification – Gain Chart and Lift Chart – Classification Tree.

UNIT V:**Gradient Descent Algorithm:**
Gradient Descent Algorithm –Advanced Machine Learning Algorithms: Dealing with Imbalanced Datasets – Advanced Regression Model – K-Nearest Neighbor Algorithm – Ensemble Methods – Random Forest.

Text Books:

1. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 2008.
2. Manaranjan Pradhan & U Dinesh Kumar, Machine Learning using Python, Wiley, 1st Edition, 2019.

Reference Book (S):

1. GeorgeLugar, AI-Structures and Strategies for Complex Problem Solving., 4/e, Pearson Education, 2002.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication, 1980.
3. Patrick H.Winston, Artificial Intelligence, 3rd Edition, Pearson Education, 1992.
4. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication, 2018.
5. Dr.DheerajMehrotra, Basics of Artificial Intelligence & Machine Learning, Notion Press, 1st Edition, 2019.

COURSE OUTCOMES

CO1: Understand the problem domain, problem formulation and introducing intelligent agents K1
CO2: Analyze the functioning of various searching methodologies in AI K2
CO3: Introduction to Machine Learning K3
CO4: Understand Regression Models K3
CO5: Understand Advanced Machine Learning Algorithms K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	M	M	M	S	S	M
CO2	S	S	M	S	M	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CST34	INTERNET OF THINGS	L	T	P	C
CORE - XIV			4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To get familiar with the evolution of IOT with its design principles • To outline the functionalities and protocols of internet communication • To analyze the hardware and software components needed to construct IOT applications • To identify the appropriate protocol for API construction and writing embedded code

UNITI: Introduction to Internet of Things

Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT& Deployment Templates. **Domain Specific IoTs:** Introduction–Home Automation–Cities – Environment – Energy – Retail – Logistics Agriculture – Industry – Health & Lifestyle.

UNIT II: IoT and M2M

Introduction: M2M – Difference between IoT and M2M – SDN and NFV for IoT. **IoT System Management with NETCONF-YANG:** Need for IoT Systems Management –Simple Network Management Protocol (SNMP) – Network Operator Requirements – NETCONF- YANG – IoT Systems Management with NETCONF_YANG.

UNIT III: IoT Platforms Design Methodology:

Introduction – IoT Design Methodology –Case Study on IoT System for Weather Monitoring– Motivation for using Python.
IoT Systems –Logical Design using Python: Introduction – Installing Python – Python Data types & Data Structures – Control Flow – Functions – Modules – Packages – File Handling –Date/Time Operations– Classes– Python packages of Interest for IoT.

UNIT IV: IoT Physical Devices & Endpoints:

What is an IoT Device – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces –Programming Raspberry Pi with Python– Other IoT devices.
IoT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs – WAMP – Auto Bahn for IoT – Xively Cloud for IoT – Python Web application Framework – Django – Designing a RESTful Web API – Amazon Web Services for IoT – SkynetIoT messaging platform.

UNIT V: Case Studies Illustrating IoT Design:
Introduction – Home Automation – Cities –Environment– Agriculture– Productivity applications
Data Analytics for IoT : Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis – Apache Oozier – Apache Spark – Apache Storm – Using Apache Storm for Real-

time Data Analysis.

TEXTBOOK(S):

1. Arshdeep Bahga,Vijay Madisetti, Internet of Things, Universities Press (INDIA) Private Ltd., 2015.

REFERENCEBOOK(S):

1. Cuno P Fister, Getting Started with the Internet of Things, O'Relly, 2011.
2. Adrian Mcewen, Hakin Cassimally, Designing the Internet of Things, Willey, 2015.
3. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRCPress, 2012.
4. Dieter Uckelmann; Architecting the Internet of Things, Mark Harrison; Florian Michahelles, (Eds.) Springer, 2011.
5. Oliver Hersent, David Boswarthick, Omar Elloumi, The Internet of Things, Key Applications and Protocols, Wiley, 2017

COURSE OUTCOMES

CO1: Understand the definition and significance of the **Internet of Things**. K1
CO2 : Discuss the architecture, operation, and business benefits of an **IoT** solution. K2
CO3: Examine the potential business opportunities that **IoT** can uncover. K3
CO4**:** Explore the relationship between **IoT**, cloud computing, and big data. K3
CO5**:** Identify how IoT differs from traditional data collection systems K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4
CO1	S	S	M	S	M	M	M	S	S	M
CO2	S	S	M	S	M	S	M	S	S	S
CO3	S	S	S	M	M	M	M	S	M	M
CO4	S	S	M	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSP33	IMAGE PROCESSING LAB	L	T	P	C
CORE - XV			-	-	6	4

1. Implement the spatial image enhancement functions on a bitmap image – mirroring(Inversion)
2. Implement the spatial image enhancement functions on a bitmap image – notation(Clockwise)
3. Implement the spatial image enhancement functions on a bitmap image –Enlargement (Double Size)
4. Implement (a) Low Pass Filter (b) High Pass Filter
5. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter
6. Implement Smoothing and Sharpening of an eight bit color image
7. Implement (a) Boundary Extraction Algorithm (b) Graham & #39; Scan Algorithm
8. Implement (a) Edge Detection (b) Line Detection
9. Display an image and its histogram
10. Write a Program to Perform Shrinking, Zooming and Cropping of an image
11. Write a Program to perform the experiment for histogram equalization.
12. Write a Program to Perform blurring and de-blurring on an image.
13. Write a Program to Remove salt and pepper noise in an image.
14. Write a Program to Perform Edge detection using Operators.
15. Write a Program to Perform2-D DFT and DCT.
16. Write a Program to Perform DWT of images.
17. Implement a function for image segmentation.
18. Implement a function for image morphology that analyze the form and shape detail of image structures.
19. Implement a function for Image Restoration.
20. Models for representing the color and methods of processing the color plane

COURSE CODE	P21CSP34	R PROGRAMMING LAB	L	T	P	C
CORE - XVI			-	-	6	4

1. Find Sum, Mean and Product of Vector in R
2. R Program to sample from a Population
3. R Program to Sort a Vector.
4. To combine the matrix using ***rbind*** and ***cbind*** methods.
5. Use seq() to create sequence.
6. Write a program to convert the table data into data frame.
7. Calculate student marklist and output it in dataframe.
8. R Program to Check Prime Number
9. R Program to Check for Leap Year.
10. R Program to Check if a Number is Odd or Even in R
11. R Program to Find the Sum of Natural Numbers
12. Convert Decimal into Binary using Recursion in R
13. R program to Find the Factorial of a Number Using Recursion
14. R Program to Make a Simple Calculator
15. Write a R Program to import CSV data into R.
16. Write a R Program to move the result data from R to CSV.
17. Draw the Line Graph for Student Data.
18. Draw the Pie-Chart for Employee Data.
19. Create a Table from the existing data set in Rand draw the chart.
20. Apply K-Means Algorithm for IRIS dataset and output it in graph
21. Get some input from mtcar dataset and perform analysis.

Semester – IV

COURSE CODE	P21CSE411	CHOICE - I	L	T	P	C
ELECTIVE - I		OBJECT ORIENTED ANALYSIS AND DESIGN	4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	● To learn the basic principles of objects and Object Oriented System Development Life Cycle. ● Learn to apply the Unified Modeling Language (UML) to elementary object – oriented analysis and design concepts. ● UML presents the concepts and techniques necessary to effectively use system requirements to drive the development of a robust design model. ● Showing how implementation details of a system can be modeled.

UNIT - I: **Introduction to Object Oriented System Development**

Introduction – Two Orthogonal views – object-oriented Systems development Methodology – Object orientation – unified approach – Object Basics – object oriented philosophy – objects – classes – attributes – behavior and methods – Message passing -Encapsulation and information hiding – hierarchy – polymorphism – object relationship and associations– aggregation– a case study–advanced topics.

UNIT–II: Object Oriented System and Methodology Development

Object oriented system development life cycle (SDLC) – development process – building high quality software – use-case driven approach – reusability –Object oriented methodologies – introduction – Booch methodology – Jacobson methodologies – patterns –frameworks – unified approach.

UNIT – III: **Unified Process and Use Case Diagrams**

Unified modeling language – introduction – static and dynamic models –modeling – unified modeling language -UML diagrams – UML class diagrams – Use-case diagram – UML dynamic modeling- model management –OOA process – introduction –difficulty in analysis – business object analysis – use-case driven object oriented analysis –business processing modeling – use-case model –developing effective documentation.

UNIT – IV: Object Classification

Object analysis – classification – common class patterns approach – use-case driven approach – CRC – naming classes – object relationships – associations – Super-Subclassrelationships– aggregation–classresponsibility–objectresponsibility-Objectorienteddesign process and design axioms – introduction – design process – design axioms- design patterns.

UNIT – V: Design Classes

Designing classes – introduction - object oriented design philosophy – UML object constraint – designing classes – class visibility – defining attributes – designingmethodsandprotocols– Packagesandmanagingclasses–Accesslayer–Objectstorageandobject interoperability – introduction – object store and persistence – Database management systems– database organization and access control– distributed databases.

TEXTBOOK(S):

1. Ali Bahrami, Object Oriented Systems Development, Irwin Mc Graw Hill Publications, 1999.

REFERENCEBOOK(S):

1. Grady Booch, Object Oriented Analysis and Design, Pearson, 2009.

COURSE OUTCOMES

CO1: Describe the basics of Object Oriented concepts - K1

CO2: Analyze the function in g methodologies provided by Boochand Jacobson; Introduction on unified approach - K2

CO3: IllustrationofUMLdiagramsapplicabletovariousphasesofsoftwaredevelopment - K3

CO4: Study on Relationship between various objects in the application and various ways of their reorientations - K3

CO5: Import knowledge on packaging classes, distributing them among layers & Introducing the object-oriented databases - K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	M	M	M	S	S	M
CO2	S	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	M	M	S	M	M
CO4	S	S	S	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	S	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSE412	CHOICE - II	L	T	P	C
ELECTIVE - I		COMPUTATIONAL LINGUISTICS	4	-	-	4

Cognitive Level	K1: Recall K2: Understand K3: Apply K4: Analyze
Objectives:	• To understand the computing Human Languages • To know the various models for computing human languages • To have competence of linguistic names which are indispensable for computing natural languages • To instruct linguistics nuances for computing human languages

Unit 1: Introduction to Tamil Linguistics

Tamil Computing Tools Development: Tamil Text Preprocessing tools: Sentence Splitter, Tokenizer, Word boundary identifier. Hands on these tools.

Unit 2: Shallow Parser

What is Shallow Parsing and How to develop a Shallow Parser (Rule based System development) Shallow parsing is an analysis of a sentence which first identifies constituent parts of sentences (nouns, verbs, adjectives, etc.) and then links them to higher order units that have discrete grammatical meanings (noun groups or phrases, verb groups, etc.). It is suitable for complex NLP applications; Morphological Analyser, Part of Speech Tagger, NP/VP Chunker, Clause Boundary Identifier.

Unit 3: Deep Parsing

Deep Parsing: Deep parsing is the search strategy which will give a complete syntactic structure to a sentence. It is the task of parsing a limited part of the syntactic information from the given task. Dependency Parser for Tamil; How to develop a dependency parser

Unit 4: Machine Translation

Application: Machine Translation

Unit 5: Applications of CL

Corpus Development in Tamil: Content Development using various methods such as Wikipedia and Blocks. Annotated Corpus of various Grammatical categories in Tamil using , Annotation tool (PALINKA for Tamil)

Text Books

1. kaNippoRiyil Tamil/கணிப்பொறியில்தமிழ்; T.Prakash/த.பிரகாஷ்Perikam/பெரிகாம் ,(நூல்வெளியீடுமற்றும்விற்பனை), 36, அசீஸ்முல்க்இரண்டாம்தெரு, ஆயிரம்விளக்கு, சென்னை-6. Tamil; 2005
2. IyarkaiMozhiyaaivuThamizh; Prof. subbaiyapillai/ கு. சுப்பையாபிள்ளை உலகத்தமிழ்ஆராய்ச்சிநிறுவனம்; 2012.
3. GATE.ac.uk - releases/gate-2.0alpha3-build516/doc/userguide.html
4. NLTK Website : 1. Language Processing and Python (nltk.org)

5. AU-KBC Tools: http://78.46.86.133:8080/aukbc-nlp/
6. Search Engine AU-KBC: Searchko: www.searchko.co.in
7. Corpus Linguistics: An Introduction Kindle Edition; Author: NiladriSekhar Dash; :Pearson; 1st
edition (1 October 2007);
8. An Introduction to Corpus Linguistics; Author: Graeme Kennedy; Routledge:1998
9. PALinkA: A high-end tool for syntactic and semantic annotation for Tamil Text: Customized by AU-KBC for Tamil . To download: http://78.46.86.133/PALinkA.tar.gz
10. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit 1st Edition; Steven Bird , Ewan Klein , Edward Loper
11. Machine Translation ; Pushpak Bhattacharyya ; Chapman and Hall/CRC; 2015

Course Outcomes:

After successful completion of the course, Student shall be able to:

CO1: Develop Tamil Computing Tools.	K2, K5
CO2: Analyse sentences using Shallow Parser.	K5
CO3: Extract Syntactic information using Deep Parser.	K4
CO4: Apply Machine Translation.	K3
CO5: Develop Tamil Corpus.	K4,K5

MAPPING OF COS WITH POS AND PSOS :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	M	M	S	M	M	M	S
CO2	M	S	S	M	M	M	M	S	M	M
CO3	M	M	S	S	S	M	S	M	M	S
CO4	S	M	S	M	M	S	M	M	M	S
CO5	M	M	S	S	S	M	S	M	M	S

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSE413	CHOICE - III	L	T	P	C
ELECTIVE - I		CLIENT SERVER COMPUTING	4	-	-	4

Cognitive Level	**K1:** Recall**K2:** Understand**K3:** Apply**K4:** Analyze
Objectives	• To Learn about Client/Server Computing: An Introduction, features objective evaluations and details of Client/Server development tools, used operating system, • To know about database management system and its mechanism in respect of Client/Server computing • To Study about network components used in order to build effective Client/Server applications. • To provide the basic concepts of client server computing and the new technologies involved

UNIT I –INTRODUCTION

Introduction-Classification of Client/Server System: Two-tier Client/Server Model-Three-tier Client/Server Model-Client/Server Advantages and Disadvantages. Driving Forces behind Client/Server Computing: Driving Forces-Development of Client/Server Systems- Client/Server Standards- Client/Server Security-Improving Performance of Client/Server Applications-Downsizing and Rightsizing-Client/Server Methodology.

UNIT II: ARCHITECTURE OF CLIENT/SERVER SYSTEMS

Components - Principles behind Client/Server Systems - Client Components-Server Components - Communications Middleware Components - Architecture for Business Information System - Existing Client/Server Architecture.

CLIENT/SERVER AND DATABASES

Client/Server in Respect of Databases-Client/Server Database Architecture-Database Middleware Component-Access to Databases-Distributed Client/Server Database Systems-Distributed DBMS

UNIT III: CLIENT/SERVER APPLICATION COMPONENTS

Technologies for Client/Server Application-Service of a Client/Server Application-Categories of Client/Server Applications-Client Services-Server Services-Client/Server Application: Connectivity-Client/Server Application: Layered Architecture.

UNIT IV: SYSTEM DEVELOPMENT

Hardware Requirements-Software Requirements-Communication Interface Technology: Network Interface Card, LAN Cabling, WAN, ATM, Ethernet, Token Ring, FDDI, TCP/IP, SNMP, NFS, SMTP

UNIT V: CLIENT/SERVER TECHNOLOGY AND WEBSERVICES

Web Services History - Web Server Technology - Web Server - Web Server Communication - Role of JAVA for Client/Server on Web - Server Technology - Client/Server Technology and Web Applications - Server's Changing Role.

FUTURE OF CLIENT/SERVER COMPUTING: Technology of Next Generation - Enabling Technology - Client/Server Computing and the Intranet – Transformational System.

TEXT BOOK

1. Subhash Chandra Yadav, Sanjay Kumar Singh: An Introduction to Client/Server Computing, New Age International Publishers, 2009.

REFERENCES

1. Alex Berson, Client Server Architecture, McGraw Hill, 1992.
2. Patrick Smith, Steve Guengerich: Client Server Computing, Second Edition, Prentice Hall of India Pvt Ltd., 2011.
3. Robert Orfali, Dan Harkey and Jerri Edwards: Essential Client/Server Survival Guide, John Wiley &Sons Inc, 1996

COURSE OUTCOMES

CO1: Comprehend the basic concepts of the client-server model. K1
CO2**:** Understand how Client-Server systems work K2
CO3: Differentiate between two-tier and three-tier architectures. K3
CO4: Improve the performance and reliability of Client Server based systems. K3
CO5: Identify security and ethical issues in Client Server Computing K4

MAPPING OF COS WITH POS AND PSOS :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**S**	**S**	**S**
CO2	**M**	**S**	**M**	**S**	**S**	**M**	**M**	**S**	**S**	**S**
CO3	**S**	**M**	**M**	**M**	**M**	**M**	**S**	**S**	**M**	**S**
CO4	**M**	**M**	**S**	**S**	**S**	**M**	**M**	**M**	**S**	**S**
CO5	**S**	**M**	**S**	**S**	**S**	**S**	**M**	**M**	**M**	**M**

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSE421	CHOICE -I	L	T	P	C
ELECTIVE -II		BIG DATA ANALYTICS	4	-	-	4
Cognitive Level	K1: Recall K2: Understand K3: Apply K4: Analyze					
OBJECTIVES	• To understand and the basic concepts of Big Data • To understand about analytics and the purpose of it • To understand the Big Data Technologies. • To develop the critical thinking and analytical approach by using Hadoop.					

UNIT I: Introduction to Big Data

Introduction- Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data - Evolution of Big data - Challenges of Big data - Other Characteristics of Data Which are not Definitional Traits of Big Data-Why Big Data? – Are we Just an Information Consumer or Do we also produce Information? - Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?

UNIT – II: Analytics Basics:

Big Data Analytics: Where do we Begin? – What is Big Data Analytics? – What Big Data Analytics Isn't? – Why this Sudden Hype Around Big Data Analytics? Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data – Top Challenges Facing Big Data – why is Big Data Analytics Important? – What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist…Your New Best Friend – Terminologies Used in Big Data Environments – Basically available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools

UNIT – III: Big Data Technologies:

The Big Data Technology Landscape: NoSQL (Not Only SQL) - Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop? – Why not RDBMS? – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview–Use Case of Hadoop – Hadoop Distributors – HDFS (Hadoop Distributed File System) Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator) – Interacting with Hadoop Ecosystem.

UNIT – IV: Introduction to MAPREDUCE Programming

Introduction – Mapper – Reducer –Combiner – Partitioner – Searching – Sorting – Compression, Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Language (HQL) –RC File Implementation – SerDe – User – Defined Function (UDF).

UNIT – V: Analytical Algorithms

Analytical Algorithms: Introduction to Machine Learning – Machine Learning Algorithms.

TEXT BOOKS:

1. Seeme Acharya, and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., First Edition-2015.

REFERENCE BOOKS:

1. Nathan Marz, and James Warren, "Big Data – Principles and best practices of scalable real–time data systems", Manning Publication cp., USA-2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Indi a Pvt. Ltd - 2015.
3. Jared Deamn,"Big Data, Data Mining and Machine Learning" ,Willey India Pvt. Ltd, 2015.

COURSE OUTCOMES

CO1**:** Describe the basics of Big Data, Types of Data and Data Warehouse Environment K1
CO2**:** Understand the Data Analytics, Evolution, Importance, Tools, Technology and Data Science K3
CO3**:** Analyze the technologies and comparison of No SQL, RDMS, Hadoop, and YARN K2
CO4**:** Analyze the working methodology of Map Reduce and Hive Query Language K4
CO5**:** Implement the Machine Learning Algorithms K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO 3	PSO 4
CO1	S	S	M	S	M	M	M	S	S	M
CO2	S	S	M	S	M	M	M	S	S	S
CO3	S	S	S	S	M	M	M	S	M	S
CO4	S	S	S	S	M	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	M	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSE422	CHOICE - II	L	T	P	C
ELECTIVE - II		SOFT COMPUTING	4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	• To give students knowledge of soft computing theories fundamentals, • To learn the fundamentals of non-traditional technologies and approaches for solving hard real-world problems. • To learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience • To introduce the ideas of fuzzy sets, fuzzy logic To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems

UNIT I: Introduction to Soft Computing

Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy Systems, Genetic Algorithm and Evolutionary Programming, Swarm Intelligent Systems, Expert Systems.

UNIT II: Introduction Neural network:

Artificial Neural Networks – First Generation - Introduction to Neural Networks, Biological Inspiration, Biological Neural Networks to Artificial Neural Networks, Classification of ANNs, First-generation Neural Networks.

UNIT III: Introduction fuzzy logic:

Fuzzy Logic – Introduction to Fuzzy Logic, Human Learning Ability, Imprecision, and Uncertainty, Undecidability, Probability Theory vs. Possibility Theory, Classical Sets and Fuzzy Sets, Fuzzy Set Operations, Fuzzy Relations, Fuzzy Composition**.**

UNIT IV: Introduction Genetic Algorithms:

Genetic Algorithms and Evolutionary Programming – Introduction to Genetic Algorithms, Genetic Algorithms, Procedures of GAs, Genetic Representations, Selection, Genetic Operators, Mutation, Natural Inheritance Operators.

UNIT V: Introduction to Swarm Intelligence:

Introduction to Swarm Intelligence – Background of Swarm Intelligent Systems, Ant Colony System, Ant Colony Optimization.

TEXT BOOK(S):

1. N.P.Padhy, S.P.Simon, 'Soft computing with MATLAB programming' Oxford University Press, First Edition, 2015

REFERENCE BOOK(S):

1. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2nd Edition, 2013.
2. Simon Haykin, Neural Networks, Pearson Education, 2003.
3. John Yen & Reza Langari, Fuzzy Logic – Intelligence Control & Information , Pearson Education, New Delhi, 2003
4. N.P.Padhy, Artificial Intelligence and Intelligent Systems Oxford University Press,2013.

COURSE OUTCOMES

CO1**:** Introduce the basic concepts and techniques of Soft Computing - K2
CO2: Differentiate Biological and Artificial Neural Network and Explain the types of Neural Networks - K3
CO3: Analyze various fuzzy models in developing fuzzy inference systems to be appropriate with specific real time problems - K4
CO4: Use genetic algorithms to combinatorial optimization problems - K1
CO5: Discuss the Optimization techniques Swam Intelligence and Ant-colony optimization - K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	S	M	M	S	S	M
CO2	S	S	M	S	M	M	M	S	S	S
CO3	S	S	S	S	M	M	M	S	S	S
CO4	S	S	S	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	M	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

COURSE CODE	P21CSE423	CHOICE - III	L	T	P	C
ELECTIVE - II		WIRELESS SENSOR NETWORKS	4	-	-	4

Cognitive Level	**K1:** Recall **K2:** Understand **K3:** Apply **K4:**Analyse
Objectives	● To study the concepts of sensor networks. ● To study the research issues in different layers of sensor networks ● To program sensor motes using data centric Programming. ● To design and Develop wireless sensor node

UNIT I: Introduction:
The vision, Networked wireless sensor devices, Applications, Key design challenges. Network deployment: Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

UNITII: Localization:
Issues & approaches, Coarse – grained & Fine – grained node localization, Network - wide localization, Theoretical analysis of localization techniques. Synchronization: Issues & Traditional approaches, Fine – grained clock synchronization, and Coarse – grained data synchronization.

UNITIII: Wireless characteristics:
Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference. Medium - access and sleep scheduling: Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep – scheduled techniques, and Contention – free protocols.

UNITIV: Sleep – based topology control:
Constructing topologies for connectivity, constructing topologies for coverage, Set-K – cover algorithms. Routing: Metric – based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy – aware routing techniques, Geographic routing, Routing to mobile sinks.

UNIT V: Data-centric networking:
Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, the database perspective on sensor networks. Reliability and congestion control: Basic mechanisms and tunable parameters, Reliability guarantees, Congestion Control, Real-time scheduling.

TEXTBOOK(S):
1. Daniel Minoli, TaiebZnati, Wireless Sensor Networks: Technology, KazemSohraby, Protocols, and Applications, Wiley Inter Science, 2007.

COURSE OUTCOMES

CO1: Discuss about Networked wireless sensor devices, design challenges and topology K1
CO2: Analyze the Localization, synchronization issues and approaches K2
CO3: Understand the wireless characteristics, MAC protocols and contention free protocols K2
CO4: Construct topology for connectivity, coverage and routing techniques. K3
CO5: Discuss about the data centric routing and Reliability and congestion control K4

MAPPING OF COS WITH POS AND PSOS

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO2	PSO3	PSO4
CO1	S	S	M	S	S	M	M	S	S	M
CO2	S	S	M	S	M	M	M	S	S	S
CO3	S	S	S	S	M	M	M	S	S	S
CO4	S	S	S	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	M	S	M	S

S – Strongly Correlating M- Moderately Correlating W-Weakly Correlating

Non Major Elective
Offered for Other Department Students

COURSE CODE	P21CSN211	CHOICE - I	L	T	P	C
SEMESTER - II		C PROGRAMMING	4	-	-	4

Cognitive Level	K1: Recall K2: Understand K3: Apply K4: Analyze
Objectives	• To introduce students to the basic knowledge of programming fundamentals of C language. • To impart writing skill of C programming to the students and solving problems. • To impart the concepts like looping, array. • To impart the knowledge on functions and pointers.

Lab Exercise:

Simple Programs:

1. Finding the largest, smallest among three numbers
2. Generate the Fibonacci sequence

Control Structures:

1. Find whether a number is prime or not
2. Find whether a given number is a perfect or not
3. Find the factorial of a number

Arrays:

1. Program for Sorting
2. Program to search an element
3. Find whether given string is a palindrome or not
4. Perform the addition of two matrices
5. Perform subtraction of two matrices
6. Perform multiplication of two matrices

Functions:

1. Program to apply Recursion
2. Program for Call by Value

Pointers:

1. Program to perform addition
2. Program for swapping two numbers

Structures:

1. Program to print student information using structures
2. Program for Array of structures

File:

1. Program for applying File operations
2. Program to get n numbers and find odd and even numbers using file.

COURSE CODE	P21CSN212	CHOICE - II	L	T	P	C
SEMESTER - II		PHOTO DESIGNING	4	-	-	4

Cognitive Level	K1: Recall K2: Understand K3: Apply K4: Analyze
Objectives	• Demonstrate knowledge of image resolution, image size, and image file format for web, video, and print. • Demonstrate knowledge of design principles, elements, and image composition. • Demonstrate knowledge of typography • Apply principles of composition to produce professional images

Unit I: Introduction

Getting into Photoshop: Introduction - Best in Photoshop 7.0 - Photoshop Interface-Saving the File-Importing Existing File.

Unit II : Editing and Retouching

Editing and Retouching: Working with Selections-Getting started with the Selection tool-Selection with Rectangle Marquee Tool-Selection with Elliptical Marquee Tool-Moving a Selection-Moving with Keyboard Shortcut-Selection with the Magic Wand-Selection with Lasso Tool-Adding and Subtraction Selection-Selection with the Magnetic Lasso-Transforming a Selection-Combining Selection Tools-Cropping the Completed Image-Quick Mask tool to make Selection-Enabling the Quick Mask Mode-Adjusting Quick Mask Setting-Patch Tool-Paint Tools-Image Color Adjustments.

Unit III: Photoshop

Making Artistic use of Photoshop: Painting Tools-Working with Brushes-Drawing-Eraser Tool-Brushes Palette-Pen Tool-Selecting an Image with Pen Tool-Editing and Cleaning Tools-Clone Stamp Tool-Healing Brush-Image Resizing.

Unit IV: Tools of Photoshop

Building Original Art work: Layers-Creating A Layer -Layer Mask-Transform-Custom shapes -Create Your own Custom shapes.

Unit V: Applications of Photoshop

Transforming Images with Filters: Filters-Text Tool-Text Wrap-Try it.

Text Book:

J. Jenitha, A. Diana, “Adobe Photoshop 7.0 - A Novice Guide” ACCA Publication, 2012.

Reference Book:

1. Deke McClelland, Laurie Ulrich Fuller Robert C. Fuller, "Photoshop CS2 Bible", Photoshop® CS2 Bible, Professional Edition, 2005.
2. “Photoshop CS6 in Simple Steps”, Kogent Learning Solutions Inc, Dreamtech Press, 2013.

COURSE OUTCOMES (CO):

CO1: Understand the different dimensions of digital data. K1
CO2: Apply the concept of data classification on different types of data K2
CO3: Analyze the characteristics of different patterns of data K3
CO4: Implement the concept of bigdata in different scenarios K4
CO5: Utilize relevant applications of tools and technology in the creation, reproduction, and distribution of visual messages. K4

Mapping of COs with POs and PSOs :

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	M	S	M	S	M	M	S	S	M	S
CO2	S	S	S	M	S	S	S	M	S	S
CO3	S	S	M	S	M	S	S	S	M	M
CO4	M	S	M	M	S	M	M	S	S	S
CO5	S	M	M	S	M	M	S	M	M	S

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSN213	CHOICE - III	L	T	P	C
SEMESTER - II		BIG DATA ANALYTICS	4	-	-	4
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives	• To study the basic technologies that forms the foundations of Big Data • To understand and apply scaling up machine learning techniques and associated computing techniques and technologies. • To identify the characteristics of datasets and compare the trivial data and big data for various applications. • To recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

Unit-I: Data Evolution

Data Development Time Line – ICT Advancement-a Perspective – Data Growth-a Perspective – IT Components-Business Process – Landscape-Data to Data Science – Understanding data: Introduction – Type of Data: Numeric – Categorical – Graphical – High Dimensional Data — Data Classification – Hot Data – Cold Data – Warm Data – Thick Data – Thin Data - Classification of digital Data: Structured, Semi-Structured and Un-Structured.

Unit-II: Sources of Data

TimeSeries–TransactionalData–BiologicalData–SpatialData–SocialNetworkDataData Evolution – Data Sources. Data Science: Data Science-A Discipline – Data Science vs Statistics – Mathematics - Programming Language - Database, - Machine Learning. Data Analytics Relation: Data Science, Analytics, Big Data Analytics.

Unit-III: Data Science Components

Data Engineering, Data Analytics-Methods and Algorithm, Data Visualization Big Data: Introduction To Big Data: - Evolution What is Big Data – Sources of Big Data. Characteristics of Big Data 6Vs – Big data- Challenges of Conventional Systems.

Unit-IV: Data Processing Models

Data Processing Models – Limitation of Conventional Data Processing Approaches – Big Data Myths - Data Discovery-Traditional Approach, Big Data Technology: Big Data Exploration - Data Augmentation – Operational Analysis – 360 View of Customers – Security and Intelligence

Unit-V: Use Cases

Big Data Use cases –Big Data Technology Potentials – Limitations of Big Data and Challenges- Big Data Roles Data Scientist , Data Architect, Data Analyst – Skills – Case Study : Big Data – Customer Insights – Behavioral Analysis – Big Data Applications - Marketing – Retails – Insurance – Risk and Security – Healthcare.

Text Book:

- V.Bhuvaneswari, T.Devi, "Big Data Analytics: A Practitioner's Approach" Sci-Tech Publishers Chennai 2016.

Reference Books

1. Han Hu, Yonggang Wen, Tat-Seng, Chua, XuelongLi, "Toward Scalable Systems for Big data Analytic" (2016)
2. Seema Acharya, Subhashni Chellappan, "Big Data Analytics", Wiley, (2015).

Course Outcomes

After completing this course, students will be able to:

CO1: Understand the key issues in big data management and its associated applications in intelligent business and scientific computing. K1

CO2: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics. K2

CO3: Interpret business models and scientific computing paradigms, and apply software tools for big data analytics. K2

CO4: Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications. K3

CO5: Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc. K4

Mapping of COs with POs and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	M	M	S	S	S	M
CO2	S	M	S	M	S	S	M	S	M	M
CO3	S	M	M	M	S	M	S	M	S	S
CO4	M	S	M	S	M	S	S	S	M	M
CO5	M	S	M	S	M	S	M	S	M	S

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSN214	CHOICE - IV	L	T	P	C
SEMESTER - II		DIGITAL IMAGE PROCESSING	4	-	-	4
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

	• To understand the basic fundamental concept of an image • To know the concepts of Image techniques, Sharpe and filtering ideas • To gain the knowledge about image patterns, structures and image compressions • To appreciate the use of current technologies those are specific to image processing systems.

Unit-I: Digital Image Fundamentals

Image formation, Image transforms – Fourier transforms, Walsh, Hadamard, Discrete cosine, Hostelling transforms.

Unit-II: Image Enhancement and Restoration

Histogram modification techniques - Image smoothening – Image sharpening - Image restoration - Degradation model – Noise models- Spatial filtering – Frequency domain filtering

Unit-III: Image compression and segmentation:

Compression Models - Elements of information theory - Error free compression - Image segmentation – Detection of discontinuities - Edge linking and boundary detection – Thresholding – Region based segmentation –Morphology

Unit- IV: Representation and description:

Representation schemes – Boundary descriptors – Regional descriptors –Relational descriptors

Unit- V: Object Recognition and Interpretation

Patterns and pattern classes - Decision - Theoretic methods -Structural methods.

Text Book:

1.Gonzalez, R.C., Woods, R.E., “Digital Image Processing”, 2nd Edition, Pearson Education,2002.

Reference Books:

1.Anil Jain, K., “Fundamentals of Digital image Processing” , Prentice all ofIndia,1989.

2.SidAhmed, “Image Processing”, McGraw Hill, New York,1995.

Course Outcomes:

After completing this course, students will be able to:

CO1: To remember the basic image concepts. K1
CO2: To know the image sharpens enhancement and compression models. K2
CO3: To apply various image techniques like edge linking and boundary detection. K3
CO4: To analyze basic requirements of image processing like structure, compression and resolution. K4
CO5: Understand the role of image segmentation, various color models and color image transformation K4

Mapping of COs with POs and PSOs :

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	M	S	M	S	S	M	S	M	S
CO3	S	M	S	M	M	S	S	M	S	S
CO4	S	S	M	S	S	M	S	S	M	M
CO5	S	M	M	M	S	S	M	M	S	M

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSN215	CHOICE - V	L	T	P	C
SEMESTER - II		MOBILE COMPUTING	4	-	-	4
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives	• To learn the basic concepts of Mobile Computing and its Applications. • To provide various emerging technologies in Mobile computing services. • To gain knowledge about GSM, GPRS, CDMA and 3G. • To study the specifications and functionalities of various protocols/standards of mobile networks.

Unit I:Introduction

Mobility of bits and bytes, wireless- The beginning, mobile computing – Networks – Middleware and Gateways – Application and Services – Developing Mobile computing Applications – Security in Mobile Computing.

Unit II **Mobile Computing Architecture**

History of Computers – History of Internet – Internet – The ubiquitous network – Architecture for Mobile Computing– Three Tire Architecture - Design consideration for Mobile Computing- Mobile Computing through Internet – Making existing Applications Mobile –Enabled

Unit - III **Mobile Communication**

Global System For Mobile Communication (GSM): Global system for Mobile Communication- GSM Architecture – GSM entities – Call routing in GSM, PLMN Interface – GSM Address Identifiers – Network aspects in GSM- GSM frequency allocation – Authentication and Security. Short Message Service (SMS) : Mobile Computing over SMS - Short Message Service- Value added services through SMS – Accessing the SMS bearer.

Unit – IV: **General Packet Radio Service (GPRS)**

General Packet Radio Service (GPRS) : Introduction – GPRS and packet data network – GPRS network architecture – GPRS network operations – Data services in GPRS – Applications for GPRS- limitations of GPRS – Billing and Charging in GPRS. Wireless Application Protocol (WAP): Introduction – WAP – MMS- GPRS application

Unit V **CDMA AND 3G**

CDMA AND 3G : Introduction – Spread spectrum technology – IS 95- CDMA versus GSM – Wireless data–Third generation network – Application on 3G. WIRELESS LAN : Introduction – Wireless LAN advantages – IEEE 802.11 standards – Wireless LAN architectures – Mobility in Wireless LAN – Deploying Wireless LAN – Mobile Ad-hoc network and sensor network – Wireless LAN Security – WiFi versus 3G.

Text Book:

1.Ashok Talukder,RoopaRYavagal,"MobileComputing",TataMcGrawHillPublishingCompanyLtd, 2005.

Reference Books:

1. Jochen Schiller, (2004), "Mobile Communications", Second Edition, Addision Wesley Publications.

2. UWE Hansmann, Lother Merk, Martin.S, (2006), "Principles of Mobile Computing", Second Edition, Springer publications.
3 Jeyasri Arokiamary,(2005), "Mobile Communications", First Edition, Anuradha Agencies.

Course Outcomes

After completing this course, students will be able to:

CO1: To member the concept of Wireless LANs, PAN, Mobile Networks K1
CO2: To understand positioning techniques of location-based services and applications K2
CO3: To apply all techniques used in the GSM and GPRS K3
CO4: To analyze CDMA and wireless LANS. K4
CO5: To design a system, component or process as per needs and specifications K3

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	M	S	S	M	S	M
CO2	M	S	S	M	S	S	M	S	S	S
CO3	S	S	M	S	S	M	S	M	S	S
CO4	M	S	M	S	S	S	S	S	S	M
CO5	S	M	M	M	S	S	M	S	M	M

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSN216	CHOICE - VI	L	T	P	C
SEMESTER - II		DATA COMMUNICATION AND NETWORKING	4	-	-	4
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives:	• To educate the concepts of terminology and concepts of the OSI reference model and the TCP/IP reference model and protocols such as TCP, UDP and IP. • To be familiar with the concepts of protocols, network interfaces, and design/performance issues in local area networks and Wide Area Networks. • Introduce the student to a network routing for IP networks and how a collision occurs and how to solve it and how a frame is created and character count of each frame. • An overview of security issues related to data communication in networks

Unit -I: **Introduction**

Introduction To Data Communications And Networking: Introduction-Fundamental Concepts - Data Communication – Protocols – Standards – Signal Propagation – Analog and Digital Signals. Information Encoding: Representing Different Symbols – Minimizing Errors - Analog and Digital Transmission Methods – Modes of Data Transmission and Multiplexing. Transmission Errors: Detection and Correction.

Unit-II: Transmission Media

Transmission Media: Guided Media - Unguided Media. Network Topologies: Mesh, Star, Tree, Ring, Bus – Switching: Circuit switching, Message switching, Packet switching. Routing Algorithms: Routers and Routing – Factors affecting Routing Algorithms – Routing Algorithms – Approaches to Routing – Network Protocols and OSI Model

Unit-III: LAN

Local Area Networks (LAN), Metropolitan Area Networks (MAN) and Wide Area Networks (WAN):LAN– Ethernet – MAN – Switched Multimegabit Data Services (SMDS) - WAN – WAN Architecture - WAN Transmission Mechanism - WAN Addressing – Packet Forwarding – Aloha - Integrated Services Digital Network (ISDN) – X.25 Protocol – Frame Relay.

Unit-IV: ATM

ynchronous Transfer Mode (ATM) - Internetworking Concepts, Devices, Internet Basics, History and Architecture – An Introduction to TCP / IP, IP, ARP, RARP, ICMP.

Unit-V: Transmission Control Protocol

Features of TCP, Relationship between TCP and IP *, Ports and Sockets, TCP connections, What makes TCP Reliable, TCP Packet Format – User Datagram Protocol (UDP): UDP Packet, Difference between UDP and TCP – Domain Name System (DNS) – Electronic Mail (Email) – File Transfer Protocol (FTP).

Text Book:

1. Achyut S. Godbole, (2007), “Data Communications and Networks”, Ninth reprint, Tata McGraw- Hill Publishing Company Limited.

Reference Books:

1. Behrouz A. Forouzan, (2007), “Data Communications and Networking”, Second Edition Update, Nineteenth reprint, Tata McGraw-Hill Publishing Company Limited.
2. Andrew S. Tanenbaum, (2001), “Computer Networks”, Third Edition, Prentice Hall

Course Outcomes :

After completing this course, students will be able to:

CO1: Understand the basics of data communication, networking, internet and their importance. K1
CO2: Understand Internet structure and can see how standard problems are solved and the use of cryptography and network security K2
CO3: Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission. K3
CO4: Identify the basic security threats of a network K4
CO5: Analyze TCP/IP and their protocols. K4

Mapping of COs with POs and PSOs :

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	M	S	M	S	S	S
CO2	S	S	S	M	S	S	S	M	S	S
CO3	M	S	M	M	S	S	S	S	M	M
CO4	S	S	M	S	S	M	M	S	S	S
CO5	M	S	M	M	S	M	S	M	S	M

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

COURSE CODE	P21CSN217	CHOICE - VII	L	T	P	C
SEMESTER - II		CLOUD COMPUTING	4	-	-	4
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives	• To understand the basic knowledge about the cloud computing techniques and architecture. • To gain knowledge of cloud services and cloud security. • To be able to understand Cloud Segment, Cloud Deployment Models and key cloud companies. • Identify and define technical challenges for cloud applications and assess their importance.

Unit –I: Introduction

Introduction - cloud computing at a glance – Historical development – Building cloud computing environment.

Unit-II: Parallel and Distributed Computing

Principles of parallel and distributed computing – Eras of computing – parallel Vs distributed computing – Elements of parallel computing – Elements of distributed computing – Technologies for distributed computing.

Unit-III: Architecture of Cloud Computing

Cloud Computing Architecture: Introduction – Cloud reference model – Types of clouds – Organizational aspects.

Unit-IV: Applications of Cloud Computing

Cloud Applications: Scientific Applications: Healthcare –Business and Consumer Applications: CRM and ERP – Media Applications – Multiplayer Online gaming

Unit-V:Cloud Security

Cloud Security – Cloud Computing Concept – Cloud Risk – Cloud Security Tools and Techniques – Data Production in Cloud – Cloud Storage – Data Loss Prevention – Cloud Application Security – Security Assertion Markup Language.

Text Books:

1.RajkumarBuyya, Christian vecchiola, Thamaraiselvi, (2013), "Mastering Cloud computing", Mc Gram Hill Publication. (UNIT – I to UNIT–IV)

2.CharlesP.Pfleeger, Shari Lawrence Pfleeger, DevenN.Shan, (2007), "Security in Computing", Fourth Edition, Prentice Hall Publication. (UNIT–V)

Reference Book:

1. Judith Hurwitz, Robin Bloon, (2009), "Cloud Computing for Dummies"

Course Outcomes:

After completing this course, students will be able to:

CO1: Identify the architecture and infrastructure of cloud computing including SaaS, PaaS, IaaS, public cloud, private cloud, and hybrid cloud. K1
CO2: Understand the core issues of cloud computing, security, privacy, and inter-operability.K2
CO3: Apply the appropriate technologies and approaches for the related issues in Cloud Computing. K3
CO4: Analyze the suitable cloud computing solutions and recommendations according to the applications used. K4
CO5: Learn the Concept of Cloud Infrastructure Model. K1

Mapping of COs with POs and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	**S**	**S**	**M**	**S**	**M**	**S**	**M**	**S**	**M**	**S**
CO2	**S**	**S**	**M**	**S**	**S**	**M**	**M**	**S**	**S**	**S**
CO3	**S**	**M**	**M**	**M**	**S**	**M**	**M**	**S**	**M**	**S**
CO4	**M**	**M**	**S**	**S**	**M**	**S**	**M**	**M**	**S**	**S**
CO5	**S**	**S**	**M**	**M**	**M**	**S**	**M**	**S**	**M**	**S**

S – Strongly Correlating M- Moderately Correlating **W-Weakly Correlating**

VALUE ADDED PROGRAMME

COURSE CODE	P21CSV11	BIG DATA ANALYTICS LAB	L	T	P	C
SEMESTER - I			-	-	-	2
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives:	• Conceptualization and Summarization of big data • Trivial data versus big data • Big data computing technologies • Machine learning techniques and Scaling up machine learning approaches

1. Installation of Hadoop:

   Three modes of Installation

   Stand Alone Mode:

   Pseudo Distributed Mode:

   Fully Distributed Mode

2. *Weather Report POC-Map Reduce Program to analyse time – temperature statistics and generate report with max/min temperature.*

   Problem Statement:

   1.The system receives temperatures of various cities (Austin, Boston, etc) of USA captured at regular intervals of time on each day in an input file.

   2.System will process the input data file and generates a report with Maximum and Minimum temperatures of each day along with time.

   3.Generate a separate output report for each city.Ex:Austin-r-00000 Boston-r-00000 Newjersy-r-00000 Baltimore-r-00000 California-r-00000 Newyork-r-00000

3. Implementing Matrix Multiplication with Hadoop MapReduce

4. Pig Latin Scripts to sort, group, join, project, and filter our data.

5. Hive Databases, Tables, Views, Functions and Indexes

6. Hive Functions:
   a. Built-in Functions
      1. Collection Functions
      2. Date Functions
      3. Mathematical Functions
      4. Conditional Functions
      5. String Functions
      6. Miscellaneous Functions

   b. UDFs (User Defined Function)

COURSE CODE	P21CSV42	SOFTCOMPUTING LAB	L	T	P	C
SEMESTER - IV			-	-	-	2
Cognitive Level		K1: Recall K2: Understand K3: Apply K4: Analyze				

Objectives:	• Introduce Neural Networks, architecture, functions and various algorithms involved • Introduce Fuzzy Logic, Various fuzzy systems and their functions. • Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory. • Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

Section-A(Fuzzy Logic)

1. a) Write a program (m.file) to calculate union, intersection, complement and difference of two fuzzy sets.
   b)Write a program (m.file) to calculate the Demorgan's Law.
2. Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not.
3. Find whether the given matrix is symmetry or not.
4. Find the fuzzy relation between two vectors *R* and *S*

   R=
   0.7 0.5
   0.8 0.4
   S =
   0.9 0.6 0.2
   0.1 0.7 0.5
   Using max–product and max-min method

5. a) Use command line commands to display the Gaussian membership function. Given x =0–10 with increment of 0.1 and Gaussian function is defined between 0.5 and −5. b) Use command line commands to display the triangular membership function. Given x = 0–10withincrement of0.2triangularmembership function is defined between [3 4 5].
6. Illustrate different types of generalized bell membership functions using a program
7. Using program, find the crisp lambda cut set relations for λ = 0.2,the fuzzy matrix is given by

   R=
   0.2 0.7 0.8 1
   1 0.9 0.5 0.1
   0 0.8 1 0.6
   0. 0.4 1 0.3

8. Temperature control of the reactor where the error and change in error is given to the controller. Here the temperature of the reactor is controlled by the temperature bath around there actor thus the temperature is controlled by controlling the flow of the coolant into the reactor. Form the membership function and the rule base using FIS editor.

9. Consider the water tank with following rules
   a) IF (level is okay) THEN (valve is no_change)(1)
   b) IF (level is low) THEN (valve is open_fast)(1)
   c) IF (level is high) THEN (valve is close_fast)(1)

   Using Mamdani method and max–min method for fuzzification and method of centroid for de-fuzzification method construct a FIS. Before editing the rules, membership functions must be defined with membership function editor.

10. a) Form a fuzzy system, which approximates function *f*, when *x*[−10,10]. Repeat the same by adding random, normally distributed noise with zero mean and Unit variance.
    b) Simulate the output when the input is sin(*t*). Observe what happens to the signal shape at the output.

11. Use Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be disgusting, not good, bland, satisfying, good, or delightful, and the service can be poor, average, or good. To get started, you type fuzzy in a window. Then use the fuzzy inference system and membership function editors to define and tune your rules.

Section-B (Neural Network)

12. Design networks of McCulloch –Pitts neurons that implement logical NOT, AND and OR gates. Draw each network and label all the weight and threshold values.

13. Derive expressions for the weights and thresholds of a McCulloch – Pitts neuron that can compute the following input-output mappings:
    in1 in2 out

    Write code for the above ANN.

14. Investigate the use of back-propagation learning using asigmoidal non-linearity to achieve one-to-one mapping, as described here:

1.f(x) =1/x	1	≤x≤100
2.f(x) =log10x,	1	≤ x ≤ 10
3.f(x)=exp(-x),	1	≤ x ≤ 10
4.f(x) =sinx,	0	≤ x ≤ π/2

    For each mapping, do the following:
    (a) Set up two sets of data, one for network training, and the other for testing.
    (b) Use the training data set compute the synaptic weights of the network, assumed to have a single hidden layer.
    (c) Evaluate the computation accuracy of the network by using the test data. Use a single layer but with a variable number of hidden neurons. Investigate how the net work performance is affected by varying the size of the hidden layer.

15. The data presented in the Table P4.17 show the weights of eye lenses of wild Australian rabbits as a function of age. No simple analytical function can exactly interpolate these data, because we do not have a single valued function. Instead, we have a nonlinear least squares model of this dataset, using a negative exponential, as described by Y =2.33.846(1– exp(-0.006042x))+□
    Where is□an error term.

Using the back - propagation algorithm, design a multiplayer perceptron that provides a non linear least - squares approximation to this data set. Compare your result against the least – sequence model described.

TableP4.17Weights of Eye Lenses of Wild Australian Rabbits

Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)
15	21.66	75	94.6	218	174.18	338	203.23
15	22.75	82	92.5	218	173.03	347	188.38
15	22.3	85	105	219	173.54	354	189.7
18	31.25	91	101.7	224	178.86	357	195.31
28	44.79	91	102.9	225	177.68	375	202.63
29	40.55	97	110	227	173.73	394	224.82
37	50.25	98	104.3	232	159.98	513	203.3
37	46.88	25	134.9	232	161.29	535	209.7
44	52.03	142	130.68	237	187.07	554	233.9
50	63.47	142	140.58	26	176.13	591	234.7
50	61.13	147	155.3	258	183.4	648	244.3
60	81	147	152.2	276	186.26	660	231
61	73.09	150	144.5	285	189.66	705	242.4
64	79.09	159	142.15	300	186.09	723	230.77
65	79.51	165	139.81	301	186.7	756	242.57
65	65.31	183	153.22	305	186.8	768	232.12
72	71.9	192	145.72	312	195.1	860	246.7
75	86.1	195	161.1	317	216.41		

Section –C (Genetic Algorithm)

16. Write a program to implement Roulette wheel and ranking selection method.
    a) Write a program to maximize a function f(x,y) = xsin(4 x) + ysin(20x) subject to -3.0 x 12.14.1 y 5.8

Reference Books:

1.N.P.Padhy, S.P.Simon, Soft computing with P programming, Oxford University Press, First Edition, 2015.

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