College of Excellence, nirf 2024-7th Rank

Autonomous and Affiliated to Bharathiar University

Reaccredited with A++ grade by NAAC, An ISO 9001: 2015 Certified Institution

Peelamedu, Coimbatore-641004

DEPARTMENT OF COMPUTER SCIENCE (PG)

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)

MASTER OF SCIENCE (COMPUTER SCIENCE)

2024 - 2026 BATCH

(Semester I,II)

M.Sc Computer Science

Programme Outcomes

After completion of the programme, the student will be able to

PO1 : Demonstrate broad knowledge in core areas of computer science, current and emerging technologies in IT

PO2: Apply higher degree of technical skills in problem solving and application development

PO3 : Gain analytical and managerial skills to enhance employment potential

PO4 : Acquire holistic development with strong emphasis on values and ethics

Programme Specific Outcomes

The students at the time of graduation will

PSO1: Identify and formulate complex problems to achieve solutions using concepts of algorithms, advanced networks, database management systems, artificial intelligence and machine learning

PSO2 : Design solutions for complex problems and design processes that meet the specific needs of the society.

PSO3: Create and apply appropriate techniques, resources and tools including prediction and
 modeling to multifaceted activities

PSO4: Apply programming and technical skills to solve real-life complex problems and   hence enhance employability

PSO5: Analyse research methods including interpretation of data and synthesis of the
 information to provide valid conclusions.

PSO6: Demonstrate skills as an individual and as a member or leader in diverse teams

PSO7: Recognize the need for life-long learning and pursue a career as a researcher or software engineer.

PSO8: Apply ethical principles and contribute effectively to the welfare of the society

Programme & Branch: M.Sc. Computer Science
Curriculum and Scheme of Examination (2024 - 2026 Batch and onwards)

Semester	Part	Course Code	Title of Course	Category	Instruction hours/week	Contact hours	Tutorial hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
I	III	MCS2401	Design and Analysis of Algorithms	CC	4	58	2	3	25	75	100	4
I	III	MCS2402	Network Security	CC	4	58	2	3	25	75	100	4
I	III	MCS2403	Modern Operating Systems	CC	4	58	2	3	25	75	100	4
I	III	MCS2404	Data Mining Techniques and Tools	CC	4	58	2	3	25	75	100	4
I	III	MCS2405	Digital Image Processing	CC	4	58	2	3	25	75	100	4
I	III	MCS24P1	Data Mining Techniques and Tools Lab	CC	5	75	-	3	25	75	100	3
I	III	MCS23P2	Full Stack Development Lab	CC	5	75	-	3	25	75	100	3
II	III	MCS23CE/ MCS2306	Python Programming** / Artificial Intelligence	CC	3	45	-	-	100	-	100	3
						43	2	3	25	75	100	
II	III	MCS2307	Internet of Things	CC	5	73	2	3	25	75	100	5
II	III	MCS2408	Pervasive Computing	CC	4	58	2	3	25	75	100	4
II	III	MCS23E1/ MCS23E2/ MCS23E5/ MCS23E8	Machine Learning/ Internet Protocol / Information Retrieval/ Soft Computing	DSE	4	58	2	3	25	75	100	4
II	III	MCS23P3	ADBMS Lab	CC	5	75	-	3	25	75	100	3
II	III	MCS23P4	Big Data Analytics Lab	CC	5	75	-	3	25	75	100	3
II	III	MTH19A5	Statistical Techniques in Practice	GC	4	60	-	3	-	100	100	4
III	III	17MONL1	Online Course		-	-	-	-	-	-		-

Course Type	Abbreviation	Courses
Core Courses	CC	All core courses, Coursera
Discipline Specific Elective	DSE	Elective in SEM III & IV Project
General Courses	GC	IDC & Research Methodology

CA Question from each unit comprising of
One question with a weightage of 2 Marks :2 x 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3=15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3 =24
                                                        Total :45 Marks

ESE Question Paper Pattern:
Question from each unit comprising of
One question with a weightage of 2 Marks: 2 x 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5=25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

Continuous Internal Assessment Pattern
Theory
- CIA Test: 5 marks (conducted for 45 marks after 50 days)
- Model Exam: 7 marks (Conducted for 75 marks after 85 days (Each Unit 15 Marks))
- Seminar/Assignment/Quiz: 5 marks
- Class Participation: 5 marks
- Attendance: 3 marks
  Total: 25 Marks

Practical Lab
- Performance: 7 marks
- Regularity: 5 marks
- Model Exam: 10 marks
- Attendance: 3 marks
  Total: 25 marks

ESE Practical Pattern
The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any.

Open book exam
    CIA Test Pattern: 4 (4 out of 6) x 15 Marks = 60 Marks

Cyber Security II:
    Quiz: 60 Marks
        Case Study: 20 Marks
        Poster: 20 Marks

PG-IDC and Special Course:

    Section A: 5 questions (Internal choice): 25 marks
    Section B: 5 questions (Internal choice): 75 marks
                            Total: 100 marks

MCS2401	DESIGN AND ANALYSIS OF ALGORITHMS	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course covers the fundamental techniques for designing and analyzing algorithms, including asymptotic analysis, Trees, graphs, divide and conquer algorithms and recurrences. It also presents effective search methods, graph algorithms and randomized algorithms

Prerequisite

Data structures and algorithms

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the performance of algorithms using analysis techniques.	K2
CLO2	Apply appropriate algorithms and data structures for various applications.	K3
CLO3	Analyze the computational complexity of various algorithms and estimate their worst-case and average-case behavior.	K4
CLO4	Evaluate the analysis of algorithm efficiency using different notations.	K5
CLO5	Design, implement, and evaluate an algorithm to meet desired needs.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	S	S
CLO2	S	S	S	M
CLO3	S	S	M	S
CLO4	M	L	S	L
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Basic concepts in Algorithmic Analysis:Introduction- Historical Background - Introduction to Sorting-**Merging Two Sorted -Selection Sort - Insertion Sort**-Bubble Sort-**Merge Sort-Quick Sort-**Bottom-up Merge Sorting- **Time Complexity- Space Complexity**- How to Estimate the Running Time of an Algorithm Worst-Case and Average-**Case Analysis- Amortized Analysis.**

UNIT II (11 Hrs)

Data Structures: Introduction- Linked Lists- Trees- Binary Trees. Heaps data structures: Introduction- Heaps- Divide and Conquer: Binary Search – Hash Table -Time complexity-Max-Min Problem-Tower of Hanoi- The Divide-and-Conquer Paradigm**- Selection: Finding the Median and the kth Smallest.**

UNIT III (11 Hrs)

AVL trees: Definition – Height – Searching – insertion and deletion of elements -**AVL rotations – Analysis.** Red black trees: Definition – Searching – **insertion and deletion of elements** – Algorithms and their time complexities. Splay trees: Definition – **Steps in Splaying** – Analysis -Multi-way Search trees: Indexed Sequential Access – M-way Search trees – B-Tree – Searching -Time Complexity for searching- **insertion and deletion.**

UNIT IV (11 Hrs)

Dynamic Programming: Introduction- The Longest Common Subsequent Problem- The Dynamic Programming Paradigm- The All-Pairs Shortest Path Problem- **Travelling sales Person problem** -The Knapsack Problem**.** Greedy Approach: Introduction- The Shortest Path Problem- **Minimum Cost Spanning Trees (Kruskal's Algorithm)- Minimum Cost Spanning Trees (Prim's Algorithm) and its time complexity.**

UNIT V (12 Hrs)

Graph Traversal: Introduction-Depth First search-**Applications of DFS** -Breadth - First search-**Applications of BFS** - Complexity of Problems: NP-complete Problems:- Introduction- The Class P-The Class NP-**NP-complete Problems**.Backtracking: Introduction -**The 8- Queens Problem- Sum of Subset Problem – Graph Coloring – Hamiltonian Cycles.**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran	Computer Algorithms	University Press Publications	**2019,** 4/e
2.	M. H. Alsuwaiyel	Algorithms Design Techniques and Analysis	World Scientific Publishing Co. Pvt. Ltd	2016,Revised Edition

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran	Fundamentals of Computer Algorithms	University Press Publications	2019, 2/e

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. S. Lakshmi Priya
2. Dr. S. Poongodi

MCS2402	NETWORK SECURITY	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course presents the fundamental concepts of cryptography and network security. It focuses on web security, IP security and system security. It also deals with the practical applications of network security.

Prerequisite

● Number Theory
● Computer Networks

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of Cryptography and Network Security	K2
CLO2	Apply Cryptography theories, Algorithms and Techniques to Build Protection Mechanisms	K3
CLO3	Analyze Cryptographic methods and algorithms for the secure storage and movement of data	K4
CLO4	Evaluate the security of the in-built cryptosystems and threats in network security	K5
CLO5	Develop cryptographic algorithms and authentication schemes for information security and authorization.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	M	S
CLO3	S	S	L	S
CLO4	S	S	S	S
CLO5	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus
UNIT I **(11 Hrs)**
Computer and Network Security Concepts: Computer Security Concepts, **OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms,** Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model,Substitution TechniquesTransposition Techniques, Rotor Machines, **Steganography**.

UNIT II (11 Hrs)

Block Ciphers and the DES: Traditional Block Cipher Structure, DES, DES Example**, Strength of DES, Block Cipher Design Principles**. Advanced Encryption Standards: AES Structure, Transformation Function, Key Expansion, Avalanche Effect. Random Bit Generation and Stream Ciphers: **Stream Ciphers**, **RC4.**Public Key cryptography and RSA: **Principles of Public–Key Cryptosystems,** RSA Algorithm.

UNIT III (12 Hrs)

Diffie-Hellman Key exchange, Elliptic Curve Cryptography. **Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA).** Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs.

UNIT IV (12 Hrs)

Digital Signatures: Introduction, Elgamal and Schnorr Digital Signature Scheme. Transport-Level Security: Web Security Considerations, Transport Layer Security, HTTPS.**Electronic Mail Security: Internet Mail Architecture, Email Formats, S/MIME, Pretty Good Privacy**

UNIT V (12 Hrs)

IP Security: Overview, Policy, Encapsulating Security Payload. Intruders: Intruders, Intrusion Detection, Password Management. **Malicious Software: Types, Viruses, Virus Countermeasures, Distributed Denial of Service Attacks. Firewalls: The Need for Firewalls, Firewall Characteristics, Types of Firewalls.**

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	William Stallings	Cryptography and Network Security	Pearson India Education	2022, 8/e

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION/EDITION
1.	Atul Kahate	Cryptography and Network Security	McGraw-Hill	2022, 4/e
2.	Bruice Schneier	Applied Cryptography – Principles, Algorithm and Source in C	Wiley India Pvt. Ltd, New Delhi	2008,2/e

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers
1. Dr. R. Kowsalya
2. Dr. M. Sasikala

MCS2403	MODERN OPERATING SYSTEMS	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course introduces the architecture of various modern operating systems. It also includes techniques such as processes and threads, security threats, RTOS, Linux and various types of OS.

Prerequisite
- Operating System
- Distributed OS

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1.	Understand the concepts of distributed operating systems.	K2
CLO2.	Apply processes and threads, Scheduling and management within the context of operating systems.	K3
CLO3.	Analyze security threats and vulnerabilities specific to operating systems	K4
CLO4.	Evaluate design principles underlying real-time operating system and its process	K5
CLO5.	Perform administrative tasks on Linux, Android and various types of OS	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1.	S	M	M	S
CLO2.	S	S	M	L
CLO3.	S	M	M	S
CLO4.	L	S	L	S
CLO5.	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I   (11 Hrs)

Distributed OS Systems – Network Hardware - Network Services and Protocols-Document Based Middleware – File system based middleware - Object based middleware- Co-ordination based middleware – **Multi computers: User level Communication software** – Remote Procedure call - Distributed shared memory – Multicomputer scheduling – Load Balancing.

UNIT II   (11 Hrs)

Processes and Threads: Process model- Process Creation-Process Termination-Process Hierarchies-Process State. **Threads**: Thread usage -Classical Thread Model-Implementing Threads in userspace

and kernel. Interprocess communication-semaphores- Message Passing-**Scheduling-Scheduling in Batch systems- Interactive Systems- Real Time Systems-Thread scheduling.** Virtualization and the cloud – History - Requirements for virtualization - Type 1 and Type2 Hypervisors - Techniques for efficient virtualization - Memory Virtualization.

UNIT III   (11 Hrs)

Security Environment: Threats – Attackers - Controlling Access to Resources - Protection Domains - Access control lists – Capabilities - Formal Models of Secure Systems - Multilevel security – Covert Channels - Authentication using a Physical object - Authentication using Biometrics – **Defenses – Code signing – Jailing – Model based intrusion detection – encapsulating mobile code.**

UNIT IV   (12 Hrs)

 Introduction to RTOS: Purpose of Real Time Operating Systems-Process Management-Memory Management-Interrupts Management-**Multitasking-**File System Management-I/O Management-Characteristics of RTOS Kernels-Priority Scheduling-**Inter task Communication and Resource Sharing**-Real Time Signals-**Semaphores**-Message Passing-Shared Memory-Asynchronous I/O-Memory Locking. **Real-Time Embedded Systems**-Real-Time Embedded System Characteristics-System Structure-Real-Time Response-Concurrency-Predictability-safety and Reliability-Hard and Soft Real-Time Embedded Systems.

UNIT V   (12 Hrs)

Linux Overview – Linux Goals-- **Linux Architecture-** Process Management system calls in Linux — Scheduling –Synchronization- Memory Management System calls- Paging – **Input –output system calls - Linux file system: File system calls in Linux** Introduction to Android - History of Android - Design Goals - Android Architecture -Types of OS–Mobile OS-iOS, Web OS- Smart OS-**Embedded OS-Memory Management-** Services Layer- Core OS Layer-File System. Practical Issues-Software Reliability-Software Faults-Reliability Measurement-Security-Challenges.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Andrew S.Tanenbaum Herbert Bos	Modern Operating Systems	Pearson Education	2023, 5/e
2.	Jiacun Wang	Real-Time Embedded Systems	John Wiley & Sons, Inc.	2017,1/e

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Shubra Garg	Fundamentals of Distributed Operating Systems	S.K. Kataria & Sons	2022,1/e
2.	Andrew S.Tanenbaum	Distributed Operating System	Pearson Education	2017,10/e

Pedagogy: Lectures, Demonstrations, Group Discussions

Course Designers:

1. Dr. S. Sasikala
2. Dr. R. Kowsalya

MCS2404	**DATA MINING TECHNIQUES AND TOOLS**	**Category**	**L**	**T**	**P**	**Credit**
		Theory	58	2	-	4

Preamble

This course presents the basic concepts of data mining and various data mining techniques like classification, clustering, and association rule mining. The course also introduces various applications of data mining such as text mining, web mining, multimedia mining, and spatial mining.

Prerequisite

- Database Management Systems
- Probability and Statistics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand data mining techniques, algorithms and data visualization	K2
CLO2	Apply data mining techniques to carry out simple data mining tasks	K3
CLO3	Analyze data mining algorithms appropriate for different data mining applications	K4
CLO4	Evaluate data mining models for solving real world problems	K5
CLO5	Develop predictive models using advanced data mining techniques for various application domains	K6

Mapping with Programme LearningOutcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	M	L
CLO3	S	S	M	L
CLO4	S	S	M	L
CLO5	S	S	M	L

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (12 Hrs)

Introduction: Need for data mining - **Kinds of data** - Patterns for mining: Characterization and Discrimination Associations - Classification and Regression - Cluster Analysis - Outlier Analysis - **Technologies - Applications - Major issues in Data Mining.** Data Preprocessing: Overview - Data cleaning - Data integration - Data reduction - Data Transformation and Discretization.

UNIT II (11 Hrs)

Association rule mining: Apriori algorithm, Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– **Correlation Analysis**– Advanced methods: **Constraint-based Pattern mining,** Mining Sequential pattern

UNIT III (12 Hrs)

Classification: Basic Concepts – Decision tree induction - Bayes Classification Methods – Lazy learners: KNN, Case-based reasoning - **Model evaluation and selection** - classification: advanced methods - Support Vector Machines-**Rule-based classifiers-** Classification with weak supervision-**Techniques to improve classification accuracy**

UNIT IV (12Hrs)

Cluster Analysis-Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods: **Agglomerative, Divisive,** BIRCH, Probabilistic Hierarchical clustering - **Density-based methods: DBSCAN, OPTICS** – Probabilistic model-based clustering: Fuzzy clusters, Probabilistic model-based clusters

UNIT V (11Hrs)

Data Mining Trends and Research Frontiers: Mining Sequence data: Time-series, Symbolic sequences and Biological sequences Mining graphs and networks Visual and audio data mining. Mining sequence patterns in Transactional databases - Spatial Data mining -Text Mining– Mining the World Wide Web.
Data mining application: Financial data analysis Retail and telecommunication-Science and engineering Intrusion detection Recommender systems.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION/EDITION
1.	Jiawei Han Jian Pei Hanghang Tong	Data Mining-concepts and techniques	Morgan Kaufmann Publishers, San Francisco.	2023, 4/e

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION/EDITION
1.	Mark A. Hall, Ian H. Witten, Eibe Frank	Data Mining: Practical Machine Learning Tools and Techniques	Morgan Kaufmann Publishers, San Francisco.	2022, 4/e
2.	Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar	Introduction to Data Mining	Pearson Education	2021

Pedagogy: Lectures, Group Discussions, Case studies
Course Designers
1. Dr. S. Poongodi
2. Ms. A. Sheela Rini

MCS2405	DIGITAL IMAGE PROCESSING	Category	L	T	P	Credit
		Theory	58	2	-	4

Preamble

This course covers the fundamental techniques to expose simple image enhancement techniques, image segmentation and representation techniques with image compression and recognition methods

Prerequisite

- Basic Mathematics, Programming Skills

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.	K2
CLO2	Apply appropriate methods on images using the techniques of smoothing, sharpening and enhancement	K3
CLO3	Analyze the restoration concepts and filtering techniques.	K4
CLO4	Evaluate the basics of segmentation, features extraction, compression and recognition methods for color models	K5
CLO5	Design and implement image compression recognition methods	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	M	S	S	S
CLO2	L	S	S	L
CLO3	S	M	S	S
CLO4	S	L	S	S
CLO5	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Digital Image Fundamentals: Fundamental steps in Digital Image Processing – **Components of an image processing system** – **Elements of Visual Perception** – Image Sensing and Acquisition – Image Sampling and Quantization – **Relationships between pixels.**

UNIT II (11 Hrs)

Image Enhancement in Spatial Domain: Histogram processing – Fundamentals of Spatial Filtering – **Smoothing and Sharpening Spatial Filtering**. Image enhancement in Frequency Domain: Basics –Smoothing using low pass frequency domain filters, Sharpening using high pass filters.

UNIT III   **(12 Hrs)**

Image segmentation and Feature extraction: Fundamentals- Point, Line and Edge detection- Thresholding- Segmentation using region growing and by Region splitting and Merging. Feature extraction: Boundary preprocessing- **Feature descriptors—Region feature descriptors.**

UNIT IV   **(12 Hrs)**

Image Compression: Fundamentals-Huffman Coding-Arithmetic Coding-LZW Coding-Run-length Coding-Symbol-based Coding-Bit-plane Coding-**Block Transform Coding-Predictive Coding.**

UNIT V   **(12 Hrs)**

Image Restoration:Degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

Recent trends in Applications: Autonomous vehicles, Augumented reality (AR) and Virtual reality (VR), Medical imaging.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Rafael C. Gonzalez, Richard E. Woods	Digital Image Processing	Pearson Publication	2018, 4/e

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION /EDITION
1.	Sandipan Dey	Hands-On Image Processing with Python	O'Reilly Publications	2018, 2/e
2.	Jayaraman S, Esakkirajan S, Veerakumar T	**Digital Image Processing**	McGraw Hill Publications.	2020.2/e

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. R. Kowsalya
2. Dr. M. Sasikala

MCS24P1	**DATA MINING TECHNIQUES AND TOOLS LAB**	**Category**	**L**	**T**	**P**	**Credit**
		Practical	-	-	75	3

Preamble

This course provides exercises to implement data mining techniques such as classification, clustering, association rule mining, and regression using data mining tools like R, Python, Knime and Tableau.

Prerequisite

- SQL, Oracle

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Implement the association rule mining, classification, clustering, prediction algorithm.	K3
CLO2	Apply data mining techniques to real world problem	K3
CLO3	Analyze the performance of various classifications, clustering and prediction algorithm.	K4
CLO4	Evaluate the features of data mining tools.	K5
CLO5	Build models using classification, clustering and prediction to solve real world problems using Python, R and Knime.	K6

Mapping with Programme LearningOutcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	S	L
CLO2	S	S	S	M
CLO3	S	S	S	M
CLO4	S	S	S	L
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement data exploration and visualization techniques in R, Tableau.
- Exercises to perform preprocessing tasks in Python
- Exercises to implement linear regression & logistic regression
- Exercises to perform classification & clustering
- Exercises to perform association rules & text mining

Pedagogy: Demonstrations
Course Designers
1. Dr. S. Poongodi
2. Dr. R. Kowsalya

List of Exercises

1. Demonstrate the following data preprocessing tasks using Python libraries.
    a) Loading the dataset   b) Identifying the dependent and independent variables
    c) Dealing with missing data
2. Demonstrate the following data preprocessing tasks using Python library
    a) Dealing with categorical data b) Scaling the features c) Splitting dataset into Training and Testing Sets
3. Demonstrate the following similarity measures using python
    a) Pearson's Correlation b) Euclidean Distance) Manhattan Distance
4. Experiment on hierarchal Data Clustering algorithms on weather data set.
5. Write a Python code to perform Clustering using the Birch algorithm.
6. Write a Python code to implement Text Mining for the corpus data.
7. Perform data exploration and visualization of the iris dataset and implement various statistical operations in R.
8. Perform data exploration and visualization of the stock dataset and implement various statistical operations in Tableau.
9. Implement linear regression for the salary dataset to predict salary based on years of experience.
10. Perform classification of the iris dataset using support vector machine (SVM) in R.
11. Build a logistic regression model to a dataset using R.
12. Apply the DBSCAN clustering algorithm to a dataset using R.
13. Perform decision tree classification using Knime.

Applications

1. Customer buying patterns using classification methods
2. Credit card Fraud Detection using Supervised algorithm
3. Breast Cancer Prediction using Supervised Algorithm
4. Customer Segmentation using Clustering
5. Loan defaulters Prediction
6. Classification of Iris Dataset

MCS23P2	FULL STACK DEVELOPMENT LAB	Category	L	T	P	Credit
		Practical	-	-	75	3

Preamble

This course provides exercises to create dynamic web application in both client and server side using CSS3, AJAX, Javascript, jQuery, PHP/ MySQL, Angular and React. It enables students to equip themselves as a full stack developer.

Prerequisite

HTML

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of Client-side /Server side web programming	K2
CLO2	Apply the form validation using jQuery	K3
CLO3	Analyze validation concepts using JavaScript	K4
CLO4	Design applications using connectivity with MySQL database	K5
CLO5	Develop dynamic web pages using PHP, MYSQL, CSS, jQuery, JavaScript, Angular and React	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	S	L
CLO2	M	S	S	M
CLO3	M	S	S	M
CLO4	M	S	S	M
CLO5	L	S	S	L

S- Strong; M-Medium; L-Low

Syllabus

- Exercise to pass information between web pages.
- Exercise to apply string functions to manipulate strings.
- Exercise to implement file operations.
- Exercise to implement the date and time functions.
- Exercise to create menus, styles, and animation using CSS and AJAX.
- Exercise to validate the HTML form fields using Javascript.
- Exercise to handle events and special effects using jQuery and jQuery traversing.
- Exercise to implement explode and implode functions
- Exercise to create database connectivity using PHP and MySQL
- Exercise using Angular
- Exercise using ReactJS

Pedagogy: Demonstrations

List of Exercises

1. Build a PHP application enabling users to input text, utilize string functions for operations like substring extraction and case conversion, and display the modified text on a web page for interactive use.
2. Design a PHP program to manage files effectively, allowing tasks such as opening, reading, updating, renaming, and deleting files for a robust file management solution.
3. Develop a PHP script to handle date and time operations, including displaying the current date/time, formatting dates, calculating time differences, and managing time zones, providing extensive functionality for managing date and time effectively.
4. Design a project focusing on implementing jQuery special effects, such as fading, sliding, or animating elements on a web page.
5. Develop a PHP project to create, manipulate, and display the content of a text file using implode() and explode() functions.
6. Create a PHP script that connects to a MySQL database and provides functionalities to manage employee records, including adding, retrieving, updating, and deleting employee information.
7. Develop a JavaScript program to count the number of elements in a registration form.
8. Build a basic calculator that performs arithmetic operations (addition, subtraction, multiplication, division) using JavaScript.
9. Create a JavaScript program to implement form validation.
10. Create a jQuery program to manage various mouse events on elements within a web page.
11. Create a password validation program using ReactJS
12. Design an Angular expression incorporating strings, numbers, and fundamental arithmetic operations.

Applications

1. Develop a PHP project for employee management, enabling data input , and display stored information on a web page.
2. Create a dynamic web application using AJAX to modify content on-the-fly based on user interactions, providing seamless and efficient content updates without page reloads.
3. Develop a web form utilizing AJAX to dynamically suggest options based on user input, enhancing user experience by providing real-time suggestions as they type.
4. Develop a PHP project for managing student details, and implementing database connectivity with MySQL. Ensure functionalities for adding, editing, and deleting student records, as well as retrieving and displaying student information.
5. Develop a project to schedule doctor appointments using ReactJS
6. Build a project to create a voting application using ReactJS.
7. Develop a project AngularJS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.

Course Code	Course Name	Category	L	T	P	Credits
MCS23CE	**PYTHON PROGRAMMING**	Theory	45	-	-	3

Preamble

This course introduces the core concepts of programming in Python. It also provides knowledge in concepts like regular expressions, text processing, multithreading, internet programming, GUI programming and database programming. It also explores Web Development using Python.

Prerequisite

- Basic concepts of Programming Language
- Database concepts

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the programming constructs of Python	K2
CLO2	Apply the concepts of Python in simple tasks	K3
CLO3	Analyze python packages suitable to develop solutions for real time problems	K4
CLO4	Evaluate the complex problems and solve using python modules	K5
CLO5	Create python projects for real time applications	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	S	M
CLO3	S	S	M	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S-Strong; M-Medium; L-Low

Sl. No.	Coursera Courses	Coursera Link	No. of Hours
1	Crash Course on Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/skills/python-programming-language?collectionId=skill~python-programming-language&productId=8D3R5HiaEeioIg7r4jw_PA&productType=course&showMiniModal=true	22
2	Capstone: Retrieving Processing, and Visualizing Data with Python	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-data-visualization?specialization=python	**9**
3	Using Python to Access Web Data	https://www.coursera.org/programs/psgr-faculty-learning-program-1luew/learn/python-network-data?specialization=python	14

Course Code	Course Name	Category	L	T	P	Credits
MCS2306	ARTIFICIAL INTELLIGENCE (SEMESTER II / III)	Theory	43	2	-	3

Preamble

This course introduces the concepts of Artificial Intelligence and the various methods of solving problems using Artificial Intelligence. It also provides insights on machine learning techniques and its applications.

Prerequisite

Probability and Statistics

Discrete Structures

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the techniques of knowledge representation and Problem solving in the field of artificial intelligence	K2
CLO2	Apply appropriate AI techniques for real time scenarios	K3
CLO3	Analyze suitable Artificial Intelligence principles to solve a given Problem	K4
CLO4	Evaluate different AI algorithms appropriate for solving a given problem	K5
CLO5	Design and develop models for predictive tasks in various Domains	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	M	M	M	L
CLO3	M	M	M	M
CLO4	S	M	M	M
CLO5	S	S	M	M

S-Strong; M-Medium; L-Low

Syllabus

UNIT I   **(9 hrs)**

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth- First, Depth First Search, Depth- first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT II (9 hrs)

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning. Randomized Search: Genetic Algorithm - Ant Colony Optimization.**Basic Knowledge Representation and Reasoning:** Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT III (9 hrs)

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.**Using Predicate Logic:** Representing simple facts in logic –Representing Instance and Is a relationship – Computable functions and predicates – Resolution

UNIT IV (8 hrs)

Representing knowledge using rules: Procedural Vs Declarative knowledge–Logic programming– Forward Vs Backward reasoning – Matching – Control knowledge

UNIT V (8 hrs)

Expert Systems: Representing and Using Domain Knowledge- Expert Knowledge Shell-Knowledge Acquisition-Perception. **Case Studies:** AI in Environmental Management (Smart Pollution Control, Water Management, Farming) - AI in Retail (Alibaba, Walmart) - AI in Medical Imaging (MRI, US, Mammography)

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Stuart Russell, Peter Norvig	Artificial Intelligence: A Modern Approach, Pearson Publishing	Pearson Publishing	2020, 4th Edition
2	G.Luger	Artificial Intelligence: Structures and Strategies for complex problem solving	Pearson Education	2009, 4th Edition
3	Lavika Goel	Artificial Intelligence: Concepts and applications	Wiley Publication	2021

Pedagogy: Lectures, Demonstrations, Case Studies

Course Designers:
1. Dr.R.Kowsalya
2. Ms.A.Sheela Rini

Course Code	Course Name	Category	L	T	P	Credit
MCS2307	INTERNET OF THINGS	Theory	73	2	-	5

Preamble

This course aims to cover the basics of Internet of Things and protocols, Internet evolving to connect people to physical things and physical things to other physical things all in real. It helps us to learn about the middleware for Internet of Things

Prerequisite

Basic knowledge of hardware and networking technology for IoT projects.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basics of Internet of Things and protocols	K2
CLO2	Implementing IoT architecture and IoT design constraints	K3
CLO3	Analyze the basics of IOT protocols and M2M	K4
CLO4	Evaluate the low-cost embedded system using IoT	K5
CLO5	Designing IoT solutions using sensors, actuators and devices in Arduino Raspberry Pi	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	M	S	M	L
CLO2	S	M	M	L
CLO3	S	S	S	M
CLO4	S	M	M	S
CLO5	M	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I   (15hrs)

Introduction to Internet of Things: Elements of an IoT - Technology drivers, Business drivers, Trends and implications, Machine-to-Machine Communications. Characteristics IoT–Physical Design of IoT-Logical Design of IoT- Functional Blocks - IoT Communication Models and APIs - IoT enabled Technologies - M2M and WSN – Cloud Computing. IoT and M2M.M2M - Difference between IoT andM2M - Software defined networks- Network functions virtualization. Communication Protocols– Issues with IoT Standardization – Unified Data Standards. IoT system Management and its protocol: Needs for IoT Management –Simple Network Management Protocol (SNMP) – Limitations of SNMP – **Network operation Requirements – IoT system with NET CONF-YANG. Application Protocols for IoT: UPnP, CoAP, MQTT, XMPP, DDS,**

AMQPSCADA, Web Socket; IP-based protocols: 6LoWPAN, RPL,mAuthentication Protocols.

UNIT II (15hrs)

Architecture for IoT: Domain model specification, Information Model Specification, Service specification, IoT Level specification, Functional view specification, Operational view specification, Device and Component Integration, User centered design, Open-source development, End user programming, Tools for IoT. IoT Platform Design Methodology: Design Methods - Connectivity Technologies (6L) 6LoWPAN- **RFID - Zigbee Bluetooth- NFC- Piconets.**M2M value chains - IoT value chains – Emerging Industrial structure of IoT. Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

UNIT III (15 hrs)

Devices a Gateway: Device types – Deployment scenarios for devices-Gateways – Data management –Local Application – Device Management – Need of Networks (LAN / WAN) - Advanced Devices- IoTanalytics – Analytical architecture –Methodology– Knowledge management – Reference model of IoTand architecture – IoT reference model – IoT domain model – Information model - Functional model – Communication model – Security and Privacy. Introduction to Arduino Structuring an Arduino Program - Simple Primitive Types- Floating-Point Numbers –Working with groups of values- Arduino String Functionality – C character Strings- Converting Number to String – Structuring the Code into FunctionBlock- **Serial communication - Input from Sensor - Input from visual output- Audio Output.**

UNIT IV (14hrs)

Introduction on Raspberry Pi: About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python. IoT Design using Raspberry Pi: IoT Applications based on Pi, LAMP Web-server- GPIO Control over Web Browser - Creating Custom Web Page for LAMP - Communicating data using on-board module- Home automation using Pi -Node-RED-MQTT Protocol, Using Node-RED Visual Editor on R pi Configuring- Wi-Fi on Raspberry Pi-MQTT (Message Queuing Telemetry Transport) protocol-**Establishing communication between IoT devices- Analyzing and processing IoT data on Raspberry Pi-Implementing security measures for IoT devices.**

UNIT V (14hrs)

Introduction to Cloud Storage Models: Overview of cloud-based IoT platforms- Cloud Deployment Models-**Cloud service Models: PaaS, SaaS, IaaS**- IoT Platform- Cloud IoT Architecture-IoT cloud services-Comparison of Google, AWS and Azure IoT Core Services – AWS IoT Core – Connecting a web application to AWS IoT using MQTT-. Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing – **Cloud Data Security.** Data analytics for IoT: MapReduce Programming model, Ozie Workflow for IoT data analysis, Setting up a Strong, Cluster, REST – based approach, Web Socket-based approach. **Broad categories of IoT applications: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT, Military Things (IoMT). Case Study: Automotive Applications, home automation, smart cards**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Arshdeep Bahgaand Vijay Madisetti	Internet of Things –A Hands-on Approach	Universities Press	2015

2	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle	From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence	Academic Press	2014 / 1st Edition
3	Monika Mangla, Suneeta Satpathy, Bhagirathi Nayak, Sachi Nandan Mohanty	Integration of Cloud Computing with Internet of Things: Foundations, Analytics, and Applications	Scrivener Publishing LLC	2021
4	Sabina Jeschke, Christian Brecher, Houbing Song, Danda B.Rawat	Industrial Internet of Things: Cyber manufacturing Systems	Springer	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Zaigham Mahmood	The Internet of Things in the Industrial Sector: Security and Device connectivity, smart environments and Industry 4.0	Springer	2019
2	Bassi, Alessandro	Enabling things to talk	Springer	2016
3	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things	CISCO Press	2017
4	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things key applications and protocols	Willey	2019

Pedagogy: Lectures, Group Discussions, Case studies.

Course Designers
1. Dr.S.Lakshmi Priya
2. Dr.R. Kowsalya

Course Code	Course Name	Category	L	T	P	Credits
MCS2408	**PERVASIVE COMPUTING**	Theory	58	2	-	4

This course covers the fundamentals of pervasive computing, focusing on its structure, challenges, resource management, human-computer interaction, mobile transactions, and green computing. It also include case studies which explore real-world applications like smart homes, autonomous vehicles, and cloud infrastructure.

Prerequisites

Computer Networks

Operating Systems

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the principles, challenges, and technologies of pervasive computing.	K2
CLO2	Apply pervasive computing techniques to solve basic problems in resource management and HCI.	K3
CLO3	Analyze mobile transactions and evaluate context-aware computing models.	K4
CLO4	Evaluate pervasive computing frameworks and their suitability for real-world applications.	K5
CLO5	Develop and implement pervasive computing solutions for emerging domains like smart homes and green computing.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	M	L
CLO3	S	S	S	L
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction: Perceptive of pervasive computing - Challenges - **Research trends in pervasive computing and networking** - Technology. Structure and elements of pervasive computing: Infrastructure and devices - Middleware for Computing Systems- Environment. **Context Collection, User tracking and context reasoning.**

UNIT II (12Hrs)

Resource management in Pervasive computing: Efficient Resource allocation in pervasive environment - Transparent Task Migration. Human- Computer Interface in pervasive computing:HCI service - **Context driven HCI Service Selection - Web service Based HCI - Migration.**

UNIT III (12Hrs)

Pervasive Mobile Transaction : Mobile Transaction Framework - Context - Aware Pervasive Transactional Model - Dynamic Transaction Management - Formal Transaction Verification - Evaluation. **Content based Recommendation in RSS Reader- Preference - based Top K- Recommendation in Social Networks.**

UNIT IV (12 Hrs)

Tools and Techniques for dynamic reconfiguration Interoperability of Pervasive Computing - Service management in Pervasive Computing- Security and Services in Pervasive Computing - **Autonomic and Pervasive Networking** - **Implementation for the framework Mobile and Pervasive Computing.**

UNIT V (11 Hrs)

Green Computing : A dual Technology for HPC and Cloud Computing. Case Studies : icampus prototype - IPSPace - Computer Based Navigation Systems, Autonomous Vechicle - Smart Homes-Vitaever cloud infrastructure. **Sustainable practices inspired by traditional Indian systems along with IKS: Energy-efficient water harvesting techniques and environmentally adaptive designs with vibhavas, anubhavas, vyabichari bhavas and rusa.**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Miniyi guo, Jingyu Zhou, Feilong Tang, Yao Shen	Pervasive computing: Concepts, Technologies and Applications	CRC Press	2016
2	Mohammad S. Obidat, Mieso Denko, Issac Woungang	Pervasive computing and Networking	Wiley Publication	2011

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Natalia silivis –cividijian	Pervasive Computing Engineering Smart systems	Springer	2017
2	Lucio Grandinetti, Ornella Pisacane, Mehdi sheikhalishahi	Pervasive Cloud Computing Technologies: Future Outlooks and Inter Disciplinary Percepectives	IGI Global	2014

Pedagogy

Lectures, Group Discussions, Case studies

Course Designers

1.Dr. R. Kowsalya
2.Ms. A. Sheela Rini

Course Code	Course Name	Category	L	T	P	Credits
MCS24P3	ADBMS LAB	Practicals	-	-	75	3

Preamble

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

Prerequisite

- RDBMS

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental differences between NOSQL and graph database	K2
CLO2	Apply object oriented, parallel and partitioning technique to optimize the execution of complex queries	K3
CLO3	Analyze the structure and performance of graph data models in Ne04j	K4
CLO4	Design and implement partitioned queries to efficiently manage and access distributed data	K5
CLO5	Develop and execute parallel queries to improve query performance and speed by utilizing multiple processing units	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	M	M
CLO2	S	M	M	M
CLO3	S	S	M	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

- Exercises to implement DDL and DML Commands.
- Exercises to implement the concepts of null constraint, unique constraint, integrity constraints, check constraints.
- Exercises to implement parallel queries.
- Exercises to implement the concepts of partitioning queries.
- Exercises to implement object-oriented concepts.
- Exercises to implement the various queries for CRUD operations in MongoDB.
- Exercises to implement Replication, Backup and Restore of database in MongoDB.
- Exercises to implement aggregate functions in MongoDB.

- Exercises to implement the various queries for CRUD operations in Neo4j.
- Exercises to implement various clauses like order by, read, write and where clause in neo4j.
- Exercises to implement string functions in neo4j.
- Exercises to implement aggregate functions in neo4j.
- Develop a simple application using VB.NET as front with database connectivity
- Develop a simple application using python as front with database connectivity

Pedagogy: Demonstrations

Course Designers
1. Dr.T.Thendral
2. Dr.K.Priya

List of Exercises

1. Create an employee table and perform Insertion, updation, deletion and set the following constraints.
   a) Primary
   b) Foreign Key
   c) Check
   d) Unique
   e) Null
2. Create an employee table and perform following join operation.
   a) Self join
   b) Inner join
   c) Outer join
   d) Left join
   e) Right join
3. a) Create sales table with (sid, sname, sale_amount, sale_date) perform range partition with sales_date for (January February, March).
   b) list and hash partitioning.
4. a) Create table employee (empno, dept, salary) and another table emp2 using the parallel query concepts.
5. Create a type address (street, city, state) as object and create table employee using the same type. Insert values and update the address of an employee.
6. Write queries in MongoDB to create student collection with id ,name, course, percentage. Createanother collection student2 with id, age, gender, address
   a) Display all students coming from Coimbatore.
   b) Display all students getting above 50 percent.
   c) Display all female students coming from Erode.
   d) Display all bsc students in descending order of their percentage.
7. Write queries in MongoDB to perform CRUD Operations:
   a) Insert a sample of 5 users into the database with various profile details. Then, retrieve users with usernames starting with 'A'.
   b) Update the email address of a specific user. Ensure that the change is reflected in the database.
   c) Identify and delete users who have not logged in for more than six months.
8. Write queries in MongoDB to perform Querying and Filtering:
   a) Retrieve products with a price between $50 and $100 in the "Electronics" category.
   b) Retrieve posts created within the last 30 days and sort them by the creation date.
9. Write queries in MongoDB to perform Aggregation:
   a) Calculate the average rating of products based on customer reviews using the

aggregation framework.
b) Find the top 5 posts with the highest number of comments using the aggregation framework.
10. Write queries in MongoDB to create a student database
    a) Create a backup of student database
    b) Restore student database from the backup.
11. Write basic Cypher queries in Neo4j for creating Node and Relationship:
    a) Create two nodes representing users with properties like name and email.
    b) Establish a friendship relationship between two users. Create a relationship type like FRIEND_OF.
    c) Create nodes representing different cities with properties like name and population. Connect the users to the cities with a relationship type indicating their current residence.
12. Write basic Cypher queries in Neo4j for Retrieving Data Using MATCH,WHERE, and RETURN clauses.
    a) To retrieve all nodes of a specific label (e.g., User). Return the names and email addresses of these users.
    b) Retrieve the friendship relationships (FRIEND_OF) between users. Return the names of the users who are friends.
    c) To find users who live in a specific city. Use the MATCH and WHERE clauses.

Applications

1. Develop an application for Banking Management system.
2. Design and implement an application of inventory for Super Market
3. Develop an application for student information system.
4. Design and develop an application for doctor's appointment.
5. Design and develop an application for Employee payroll.

Course Code	Course Name	Category	L	T	P	Credits
MCS23P4	**BIG DATA ANALYTICS LAB**	**Practicals**	-	-	75	3

Preamble

This course provides hands-on to the introduction of Hadoop framework and its components like pig, spark, hive and scala with distributed environment through map reduce programming.

Prerequisite
SQL, DBMS

Course Learning Outcomes
On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand Hadoop components for big data processing and building a Hadoop cluster.	K2
CLO2	Apply Pig on executing Map reduce program .	K3
CLO3	Analyze the large sets of data representing them as Data flow.	K4
CLO4	Design a self-optimizing data transformation.	K5
CLO5	Develop Spark, Hive, Cassandra and Zepplin for data processing	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	S	M	L
CLO2	S	S	M	L
CLO3	S	S	M	M
CLO4	S	S	S	M
CLO5	S	S	S	M

S- Strong, M-Medium,
L-Low

Syllabus
1. Setting up a Hadoop environment
2. Exercises to implement file management tasks using Hadoop
3. Exercises to implement Map Reduce program that mines patient data
4. Exercises to implement Pig Latin scripts to sort, group, join, project, and filter data.
5. Exercises to implement simple processing tasks in Spark & Scala.
6. Exercises to implement basic operations in Spark SQL.
7. Exercise to implement Spark RDD actions.
8. Exercise to implement Hive, Cassandra and Zepplin.

List of Exercises:

1. Implement the following file management tasks in Hadoop: Adding files and directories, retrieving files, Deleting Files.

2. Develop a Map Reduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.

3. Develop a Map Reduce to analyze weather data set and print whether the day is shiny or cool day.

4. Write a Pig script to find the Count of Gender and Hobbies.

5. Write a program to find the number of words using Pig Script.

6. Write a Program to Creation, Alter, and Dropping Internal and External tables in Hive

7. Write a Program to implement Tables, Partitions, and Buckets in Hive.

8. Implement Built-in Functions in Hive for employee and student details.

9. Write a Hive Program to perform four types of join operations for customer table.

10. Write a Scala program that creates a class Employee with properties like name, age, and designation. Implement a method to display employee details.

11. Write a Scala program to test if a given string contains the specified sequence of char values.

12. Write a Scala program to create a map and find the minimum and maximum values in the map.

13. Write a Scala program to create Data frame and perform group by Operations with Summer Olympic data.

14. Write a program to create and use a key space in Cassandra using Java API.

15. Write a program to add a column to an existing table in Cassandra using Java API.

16. Write a Scala program to find the count of words in a document using Spark RDD.

Applications

17. Write a simple YARN client Application. Develop a Map Reduce program to calculate the frequency of a given word in given file.

18. Analyze the Cyber Crime Data set and display the results in charts using Zeppelin.

19. Develop an online using Interactive Queries and prepare Charts using Zeppelin.

20. Develop a Scala Application to generate the Student Grade Analysis.

Pedagogy: Demonstrations

Course Designers
1. Dr. K. Priya
2. Dr. R. Kowsalya

Course Code	Course Name	Category	L	T	P	Credits
MCS23E1	**MACHINE LEARNING**	Theory	58	2	-	4

Preamble

This course introduces the fundamentals of Machine Learning and its algorithms. It also covers various supervised and unsupervised learning algorithms for classification, prediction and clustering.

Prerequisite

- Linear Algebra
- Data Mining

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand supervised, unsupervised and semi-supervised learning	K2
CLO2	Apply supervised and unsupervised learning algorithms for classification, prediction and clustering	K3
CLO3	Analyze the efficiency of machine learning algorithms suitable for applications.	K4
CLO4	Evaluate various machine learning models.	K5
CLO5	Design an appropriate model for any given application	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	M	S	M	L
CLO2	S	M	M	L
CLO3	S	M	S	M
CLO4	S	S	M	M
CLO5	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

Introduction: Machine learning Basics – **Examples of machine Learning Applications.** Supervised Learning: Learning a class from Examples - Vapnik- Chervonenkis Dimension - Probably Approximately Correct Learning – Noise - Learning Multiple Classes – Regression - **Model Selection and Generalization** - Dimensions of a Supervised Machine Learning Algorithm.

UNIT II   (12 Hrs)

Bayesian Decision Theory: Classification - Losses and Risks - Discriminant Functions - Association Rules. Parametric Methods: Maximum Likelihood Estimation - Evaluating an Estimator: Bias and Variance - The Bayes' Estimator - Parametric Classification – Regression - **Tuning Model Complexity: Bias/Variance Dilemma - Model Selection Procedures.**

UNIT III   (12 Hrs)

Multivariate Methods: Multivariate Data - Parameter Estimation - Estimation of Missing Values - Multivariate Normal Distribution - Multivariate Classification - Tuning Complexity - Discrete Features - Multivariate Regression. Nonparametric Methods: Nonparametric Density Estimation - Generalization to Multivariate Data - **Nonparametric Classification - Condensed Nearest Neighbor - Distance-Based Classification - Outlier Detection - Nonparametric Regression: Smoothing Models.**

UNIT IV   (12 Hrs)

Decision Trees:Univariate Trees – Pruning - Rule Extraction from Trees - **Learning Rules from Data** - **Multivariate Trees**. Clustering: Mixture Densities - k-Means Clustering - Expectation-Maximization Algorithm - Mixtures of Latent Variable Models - Supervised Learning after Clustering - Spectral Clustering - Hierarchical Clustering - **Choosing the Number of Clusters.**

UNIT V   (11 Hrs)

Multilayer Perceptrons: Introduction – Perceptron - Training a Perceptron - **Learning Boolean Functions Multilayer Perceptrons** - MLP as a Universal Approximator - Back propagation Algorithm - Training Procedures - **Tuning the Network Size** - Bayesian View of Learning - Dimensionality Reduction -Learning Time. **WEKA Implementations.**

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICA TION/EDI TION
1.	Ethem Alpaydm	Introduction to Machine Learning	The MIT Press	2020, 4/e

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATI ON / EDITION
1.	Ian Witten	Data mining: Practical Machine Learning Tools and Techniques	Morgan Kaufmann Publishers	2016, 4/e
2.	Tom M. Mitchell	Machine Learning	Tata McGraw-Hill, New Delhi	2017, 1/e

Pedagogy

Lectures, Group Discussions, Demonstrations.

Course Designers

 1.Dr. T.Thendral

2.Dr. R.Kowsalya

Course Code	Course Name	Category	L	T	P	Credits
MCS23E5	**INFORMATION RETRIEVAL**	**Theory**	**58**	**2**	**-**	**4**

This course presents the concepts of document representation, document indexing, digital information storage, retrieval and distribution. It also introduces effective search strategies for IR systems, vector space model, text classification and evaluation methods of IR systems.

Prerequisite
- Database Management systems
- Datamining

Course Learning Outcomes
Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of document representation, document indexing, digital information storage, retrieval and distribution	**K2**
CLO2	Apply the concepts of vector spaces and classifiers to perform document classification.	**K3**
CLO3	Analyze the strengths and weaknesses of various Information Retrieval models.	**K4**
CLO4	Evaluate the effectiveness of different search strategies used in Information Retrieval systems.	**K5**
CLO5	Assess and design an information retrieval system tailored for specific use cases.	**K6**

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4
CLO1	S	M	M	L
CLO2	S	M	M	L
CLO3	S	S	M	M
CLO4	S	M	S	M
CLO5	S	S	S	M

S-Strong; M-Medium; L-Low

Syllabus

UNIT I (11 Hrs)

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

UNIT II   (12 Hrs)

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

UNIT III   (12 Hrs)

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

UNIT IV   (12 Hrs)

XML retrieval: Basic XML concepts – A vector space model for XML retrieval – Evaluation of XML retrieval - Text-centric vs. data-centric XML retrieval. **Text classification and Naive Bayes**: The text classification problem- Naive Bayes text classification - Properties of Naive Bayes – Feature selection - **Evaluation of text classification**

UNIT V   (11Hrs)

Vector space classification: Document representations and measures of relatedness in vector spaces – **Rocchio classification** - Flat clustering: Clustering in information retrieval - Evaluation **of clustering** - **K-means** –Web search basics – Web characteristics - Advertising as the economic model– Search user experience – Basic Page Rank

TextBook

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Christopher D.Manning, Prabhakar Raghavan, Henrich Schutze	Introduction to Information Retrieval	Cambridge University Press	2018 / 1st Edition

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION / EDITION
1	Stefan Buttcher et.al	Information Retrieval- Implementing and Evaluating	MITPress	2012
2	Dr Ricardo Baeza-Yateset.al	Modern Information Retrieval: The Concepts and Technology	Addison Wesley	2012
3	David A.Grossman andophir Frieder	Information Retrieval	Universities Press	2010 / 2 Edition

Pedagogy: Lectures, Demonstrations, Guest Lectures, Video Lectures
Course Designers

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