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 OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

MASTER OF SCIENCE IN COMPUTER SCIENCE
2025 - 2027 BATCH
SEMESTER I

M.Sc Computer Science

Programme Outcomes

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

PLO1: Demonstrate broad knowledge in core areas of computer science, current and emerging technologies in IT

PLO2: Apply higher degree of technical skills in problem solving and application development

PLO3: Gain analytical and managerial skills to enhance employment potential

PLO4: 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

MASTER OF SCIENCE IN COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS) &

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION

2025 - 2027 BATCH – SEMESTER I

Semester	Course Code	Title of the Course	Course Type	Instruction Hours/week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
								CA	ESE	Total	
I	MCS2501	Advanced Design and Analysis of Algorithms	CC	4	58	2	3	25	75	100	4
I	MCS2502	Advanced Network Security	CC	4	58	2	3	25	75	100	4
I	MCS2503	Modern Operating Systems	CC	4	58	2	3	25	75	100	4
I	MCS2404	Data Mining Techniques and Tools	CC	4	58	2	3	25	75	100	4
I	MCS2505	Digital Image Processing	CC	4	58	2	3	25	75	100	4
I	MCS24P1	Data Mining Techniques and Tools Lab	CC	5	75	-	3	25	75	100	3
I	MCS23P2	Full Stack Development Lab	CC	5	75	-	3	25	75	100	3
I-III	17MONL1	Online Course	ACC	-	-	-	-	-	-	-	-

Course Type	Abbreviation	Courses
Core Courses	CC	All core courses
Additional Credit Courses	ACC	Online Courses

EXAMINATION SYSTEM

Pattern

Semester system will be followed. A semester consists of a minimum of 90 working days excluding the days of conduct of ESE. There will be Continuous Internal Assessment (CA) to evaluate the performance of students in each course and the End Semester Examination will be held at the end of every semester.

Weightage assigned to various components of Continuous Internal Assessment

Theory

CIA Test	: 5 marks (conducted for 45 marks after 50 days)
Model Exam	: 7 marks (conducted for 75 marks after 85 days)
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

CA Question Paper Pattern and distribution of marks - (First 3 Units)

Core and Elective Courses

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

End Semester Examination - Question Paper Pattern and Distribution of Marks
Core and Elective Courses

ESE Question Paper Pattern : 5* 15 = 75 Marks
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

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.

Criteria for Attendance

3 Marks (Attendance 75%- 80% - 1 Mark, 81%-90% - 2 Marks, 91%- 100%   - 3 Marks)

Course Code	Course Title	Category	L	T	P	Credits
MCS2501	ADVANCED DESIGN AND ANALYSIS OF ALGORITHMS	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 fundamental algorithmic concepts and performance analysis including time-space trade-offs and recurrence relations.	K2
CLO2	Apply appropriate algorithm design strategies to solve computational problems.	K3
CLO3	Analyze the complexity and efficiency of algorithms, including sorting, hashing, graph, and tree-based algorithms using worst-case and average-case analysis.	K4
CLO4	Evaluate algorithmic efficiency using asymptotic notations and apply amortized analysis, parallel processing techniques, and performance optimizations.	K5
CLO5	Design and implement optimal algorithmic solutions for real-world applications such as scheduling, string processing, and graph-based problems.	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

UNIT I (11 Hrs)

Introduction: Algorithms - Analyzing Algorithms - Complexity of Algorithms - Classification of Algorithms - Time-space Trade-offs: Counting Sort - Bucket Sort - Radix Sort - Shell Sort - Topological Sort - Hashing and Hash Tables: Introduction to Hash tables - Hash Functions Construction- Hash Table Operations - Collision Resolution Techniques. **Introduction to M-array Trees: B Trees - B+ Trees.** Recursive Algorithm – Techniques for solving Recurrence Equations. **Amortized Analysis.**

UNIT II (12 Hrs)

Divide and Conquer Approach - Recurrence Equation for Divide and Conquer - Advantages and

Disadvantages of Divide-and-Conquer Paradigm - **Merge Sort - Quick Sort: Partitioning Algorithms - Variants of Quick Sort**. External Sorting: Sorting with Disk - Sorting with Tapes - Strassen's Matrix Multiplication - Closest-pair Problem - Convex Hull: Quick hull – Merge hull. **Fourier Transform for Polynomial Multiplication.**

UNIT III   (12 Hrs)

Greedy Algorithms: Introduction - Components of Greedy Approach - Coin Change Problem - Scheduling Problems: **Shortest Job First Scheduling - Knapsack Problem,** Minimum Cost Spanning Trees – Tree Vertex Splitting Problem - Single-Source Shortest-Path Problem - Dijkstra's Algorithm - Heuristic Approach for Travelling Salesperson Problem - **Job sequencing with deadlines - Optimal merge pattern.**

UNIT IV   (12 Hrs)

Dynamic Programming: Introduction - Components of Dynamic Programming - Fibonacci Problem: Bottom-Up Approach - Top-Down Approach - Matrix Chain Multiplication - **Floyd-Warshall Algorithm - Longest Common Subsequence (LCS)** - Parallel Algorithm: Classification of Parallel System - Flynn Classification - Address-Space-Memory Classification - Classification based on Interconnection Networks. **Parallel Searching and Parallel Sorting.**

UNIT V   (11 Hrs)

Backtracking: Concept and General Approach - Generation of State Space Trees - Searching state Space Trees - Vertex Colouring Problem - N-Queens Problem - Sum of Subset Problem - Hamiltonian Cycle. **Randomized Algorithms: Generation of Random Numbers - Hiring Problem -Comparing Two Strings using Randomization Algorithms - Randomized QuickSort.**

CASE STUDY: Word Frequency Analysis, Plagiarism detection using string search algorithms, Travel planner using graph, Cash flow minimizer, Real-time analysis, Email Spam Filter.

Text Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran	Computer Algorithms	University Press Publications	2019, 4th Edn
2.	S. Sridhar	Design and Analysis of Algorithms	Oxford University Press	November 2023, 2nd Edn
3	M. H. Alsuwaiyel	Algorithms Design Techniques and Analysis	World Scientific Publishing Co. Pvt. Ltd	2016, 2nd Edn

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eference Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION

1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran	Fundamentals of Computer Algorithms	University Press Publications	2019, 2nd Edn
2.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein	Introduction to Algorithms	MIT Press	2022, 4th Edn

Pedagogy: Lectures, Group Discussions, Case studies

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

Course Code	Course Title	Category	L	T	P	Credits

MCS2502	ADVANCED NETWORK SECURITY	Theory	58	2	-	4

Preamble

This course covers network security techniques, cryptographic protocols, and attack detection mechanisms. It focuses on analyzing security threats and implementing cryptographic solutions for secure communication.

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 network protection, monitoring, and detection techniques.	K2
CLO2	Apply security protocols and standards to ensure secure communication.	K3
CLO3	Analyze network attacks and vulnerabilities in cryptographic systems.	K4
CLO4	Evaluate authentication protocols and key exchange mechanisms.	K5
CLO5	Develop secure key agreement protocols and cryptographic solutions.	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

UNIT I (11 Hrs)

Techniques for Network Protection, Monitoring and Detection: Firewalls, packet filter and stateful firewalls, application aware firewalls, personal firewalls-IPtables, Proxies, NAT, Intrusion Detection System-Snort, Signature and Anomaly based detection, Honeypots and Honeynets, **Network Log management-syslog or SPLUNK; RBAC: Role mining; DNS-Dig tool: DNSSEC-DS and NSEC records.**

UNIT II (12 Hrs)

Protocols and Standards: SCP, SSH, SSL3.0, TLS 1.2, STARTTLS, IPSec, VPN and Secure HTTP; Encrypting and Signing Emails: PGP- GPG/open PGP, **DKIM and SPF; Single Sign On (SSO)-OAUTH and OPENID.**

UNIT III (12 Hrs)

Attack Techniques: Network reconnaissance-Nmap and vulnerability audits-openVAS; DNS based attacks, Phishing-DNS Twist; Network based malware attacks: Remote access TrojanPoison Ivy and Domain name generation algorithm based Botnets; LAN attacks: ARP Cache poisoning- Ettercap/arpspoof, MAC flooding,

Man in the middle attacks, Port Stealing, DHCP attacks, VLAN hopping; **Network Sniffing - Wireshark and Password Cracking-John the Ripper; Attacks on SSL/TLS: SSL stripping, Drown and Poodle attack; Network packet creation and Manipulation using scapy and dpkt libraries.**

UNIT IV   (12 Hrs)

Protocols for identification and login: Interactive protocols, ID protocols, Password protocols, Challenge-response protocols, Schnorr's identification protocol, Proving properties in zero knowledge. Authenticated Key Exchange: Goals for authentication and Key Establishment, encryption based protocol and its attacks, Perfect forward secrecy, Protocol based on ephemeral encryption, **Attacks on Insecure variations, Identity protection, One-sided authenticated key exchange, Security of protocol AKE1, Password authenticated key exchange - Phishing attacks, Protocol PAKE0, Protocol PAKE1, Protocol PAKE2, Explicit key confirmation.**

UNIT V   (11 Hrs)

Classes of Key Agreement protocols: Diffie Hellman Key Agreement, MTI Protocols, Diffie Hellman- Based Protocols. Protocols not based on Diffie Hellman. Pairing based cryptographic protocol: ID based encryption schemes, Boneh and Franklin's Scheme, Shamir's encryption and signature schemes. **Conference Key protocols: Security goals, Static and dynamic groups, Generalizing Diffie- Hellman key agreement.**

Text Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	William Stallings	Cryptography and Network Security: Principles and Practice	Pearson	2020, 8th Edn
2	Behrouz A. Forouzan	Cryptography & Network Security	McGraw-Hill	2015, 3rd Edn
3	Colin Boyd, Anish Mathuria, Douglas Stebila	Protocols for Authentication and Key Establishment	Springer	2020, 6th Edn
4	Dan Boneh, Victor Shoup	A Graduate Course in Applied Cryptography	-	2020, 3rd Edn

Reference Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	W. Stallings	Network Security Essentials: Applications and Standards	Pearson Prentice Hall	2016, 6th Edn
2	Bryan Sullivan, Vincent Liu	Web Application Security, A Beginner's Guide	McGraw-Hill Education	2012, 2nd Edn

3	C. Kaufman, R. Perlman, M. Speciner	Network Security: Private Communication in a Public World	Prentice Hall PTR	2002, 2nd Edn
4	J. Menezes, P. C. V. Oorschot, S. A. Vanstone	Handbook of Applied Cryptography	CRC Press	1996, 1st Edn
5	J. Pieprzyk, T. Hardjono, J. Seberry	Fundamentals of Computer Security	Springer	2003, 2nd Edn
6	Abhijit Das, Veni Madhavan C. E.	Public-Key Cryptography: Theory and Practice	Pearson Education	2009, 3rd Edn
7	L. Dong, K. Chen	Cryptographic Protocol: Security Analysis Based on Trusted Freshness	Springer	2012, 4th Edn

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. R. Kowsalya
2. Mrs. A. Sheela Rini

Course Code	Course Title	Category	L	T	P	Credits
MCS2503	**MODERN OPERATING SYSTEMS**	**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 architecture and communication mechanisms in distributed operating systems.	K2
CLO2	Apply concepts of process and thread management, inter-process communication, and scheduling in various operating system environments.	K3
CLO3	Analyze security threats and vulnerabilities specific to operating systems	K4
CLO4	Evaluate the role and functionality of Real-Time Operating Systems (RTOS) including task scheduling, memory management, and inter-task communication.	K5
CLO5	Design and examine innovations such as virtualization, cloud, IoT, and mobile operating systems.	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

UNIT I (12 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. Trends in OS Design: Virtualization and the cloud – Manycore Chip – Large address space OS – Seamless data access – Battery – Powered Computing Embedded systems – **OS Structure: Monolithic Structure - Layered System - Virtual Machine - Exo Kernel – Client-Server Model.**

UNIT II (10 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.**

UNIT III (12 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 – 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 -** Scheduling – Synchronization - Memory Management System calls - Paging – **Input – output system calls - 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.

Case Study: Virtualization and Cloud OS – Windows 8 – Windows 11 - Security Enhancements - IoT and Embedded OS. Challenges and Future Trends in Modern Operating System.

Text Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Andrew S.Tanenbaum Herbert Bos	Modern Operating Systems	Pearson Education	2023, 5th Edn
2.	Jiacun Wang	Real- Time Embedded Systems	John Wiley & Sons, Inc.	2017,1st Edn

Reference Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Shubra Garg	Fundamentals of Distributed Operating Systems	S.K. Kataria & Sons	2022, 1st Edn
2.	Andrew S.Tanenbaum	Distributed Operating System	Pearson Education	2017,10th Edn

Pedagogy: Lectures, Demonstrations, Group Discussions

Course Designers

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

Course Code	Course Title	Category	L	T	P	Credits
MCS2404	**DATA MINING TECHNIQUES AND TOOLS**	**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 Learning Outcomes

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

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 Pre-processing: 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 – **Rule-based classifier(classification)-** Classification with weak supervision- **Techniques to improve classification accuracy**, **Model evaluation and selection**. Classification: Advanced Methods: Lazy learners: KNN, Case-based reasoning, Support Vector Machines**.**

UNIT IV (12 Hrs)

Cluster Analysis-Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods: **Agglomerative**

versus Divisive, BIRCH, Probabilistic Hierarchical clustering - **Density-based methods: DBSCAN, OPTICS** – Probabilistic model-based clustering: Fuzzy clusters, Probabilistic model-based clusters

UNIT V   **(11 Hrs)**

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. **Case Study: Financial data analysis, Retail and Telecommunication -Science and Engineering, Intrusion Detection and Prevention, Recommender systems.**

Text Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Jiawei Han Jian Pei Hanghang Tong	Data Mining-concepts and techniques	Morgan Kaufmann Publishers, San Francisco.	2023, 4th Edn

Reference Books

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

Pedagogy : Lectures, Group Discussions, Case studies

Course Designers
1. Dr. T.Thendral
2. Dr.R.Kowsalya

Course Code	Course Title	Category	L	T	P	Credits
MCS2505	**DIGITAL IMAGE PROCESSING**	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 image processing techniques in both the spatial and frequency (Fourier) domains.	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 evaluate image analysis techniques	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

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.- Region segmentation using clustering and super pixels - Region segmentation using Graph cuts - segmentation using Morphological Watersheds – The use of motion in segmentation - Feature extraction: Boundary preprocessing- **Boundary Feature descriptors - Region features descriptors – Principal Component as Feature descriptors.**

UNIT IV (12 Hrs)

Image Compression: Fundamentals-Huffman Coding-Golomd coding - Arithmetic Coding – LZW coding - DCT implementation using FFT Sub-image size selection Coding-Run- length Coding-Symbol-based Coding-Bit-plane Coding-**Block Transform Coding-Predictive Coding -Wavelet 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.

Case study: Medical Imaging Analysis, Facial Recognition Technology, Agricultural Applications, Historical Document Restoration and Analysis, Entertainment and Media, Autonomous vehicles AR/VR in image processing.

Text Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Rafael C. Gonzalez, Richard E.Woods	Digital Image Processing	Pearson Publication	2018, 4th Edn
2.	S.Jayaraman,S.Esakki rajan,T.Veerakumar	Digital Image Processing	Tata Mc Graw Hill	2020,2nd Edn

Reference Books

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Sandipan Dey	Hands-On Image Processing with Python	O'Reilly Publications	2018, 2nd Edn
2.	Wilhelm Burger , Mark J. Burge	Digital Image Processing An Algorithmic Introduction	Springer	2022,3rd Edn

Pedagogy: Lectures, Group Discussions, Case studies

Course Designers
1. Dr. S.Lakshmi Priya

Course Code	Course Title	Category	L	T	P	Credits
MCS24P1	**DATA MINING TECHNIQUES AND TOOLS LAB**	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 Learning Outcomes

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

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 classification of the iris dataset using support vector machine (SVM) in R.

9. Build a logistic regression model to a dataset using R.

10. Apply the DBSCAN clustering algorithm to a dataset using R.

11. Perform data exploration and visualization of the stock dataset and implement various statistical operations in Tableau.

12. Perform decision tree classification using Knime.

13. Perform Apriori Algorithm (Frequent Itemset Mining) 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

Course Designers

1. Dr. T. Thendral
2. Dr. R. Kowsalya

Course Code	Course Title	Category	L	T	P	Credits
MCS23P2	**FULL STACK DEVELOPMENT LAB**	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 responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid

2. Using AJAX Create visual search feature to search using name for practical number 15 which list name, mobile number and email id of matching users.

3. Design a project focusing on implementing jQuery special effects, such as fading, sliding, or animating elements on a web page.

4. Develop a JavaScript program to count the number of elements in a registration form.

5. Write a program to create and Build a Password Strength Check using Jquery.

6. Create a jQuery program to manage various mouse events on elements within a web page.

7. Create a password validation program using ReactJS

8. Create a voting application using ReactJS

9. Write a program to create a simple calculator Application using React JS

Applications

1. 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.

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 project AngularJS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.

5. Create Angular JS application that allows users to maintain a collection of items. The application should display the current total number of items, and this count should automatically update as items are added or removed. Users should be able to add items to the collection and remove the mas needed. Note: The default values for items may be included in the program.

6. Develop Angular JS application that displays a detail of students and their CGPA. Allow users to read the number of students and display the count. Note: Student details maybe included in the program.

7. Develop an Angular JS program to create a simple to-do list application. Allow users to add, edit, and delete tasks.

8. Write an Angular JS program to create simple CRUD application (Create, Read, Update, and Delete) for managing users

9. Create a blog using React JS Using the CMS

10. Create a project on Grocery delivery application

11. Develop a project to schedule doctor appointments using ReactJS

Course Designers

1. Dr. R. Kowsalya

PSGR
Krishnammal College for Women KCW

Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

MASTER OF SCIENCE IN COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS) &

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION

2025-2027 BATCH – SEMESTER II

Semester	Course Code	Title of Course	Course Type	Instruction hours / week	Contact hours	Tutorial hours	Duration of Examination	Examination Marks			Credits
								CA	ESE	Total	
II	MCS23CE	Python Programming	CC	3	45	-	-	100	-	100	3
II	MCS2307	Internet of Things	CC	5	73	2	3	25	75	100	5
II	MCS2408	Pervasive Computing	CC	4	58	2	3	25	75	100	4
II	MCS23E1/ MCS23E2/ MCS25E3/ MCS25E4/ MCS25E5	Machine Learning/ Internet Protocol / Information Retrieval/ Soft Computing Bioinformatics	DSE	4	58	2	3	25	75	100	4
II	MCS24P3	ADBMS Lab	CC	5	75	-	3	25	75	100	3
II	MCS23P4	Big Data Analytics Lab	CC	5	75	-	3	25	75	100	3
II	MTH19A5	Statistical Techniques in Practice	GC	4	60	-	3	-	100	100	4
I-III	17MONL1	Online Course	ACC	-	-	-	-	-	-		-

CC - Core Courses

DSE - Discipline Specific Elective

GC - General Courses

ACC - Additional Credit Courses

CA - Continuous Assessment

ESE - End Semester Examination

QUESTION PAPER PATTERN

Core Paper Pattern:
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.

PG-IDC and Special Course:

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

From the academic year 2024-25 and onwards marks allotted for attendance component in CA is modified as

91-100% attendance : 3 Marks
81-90% attendance   : 2 Marks
75-80% attendance   : 1 Marks

Course Code	Course Title	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 Title	Category	L	T	P	Credits
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 **(15 Hrs.)**

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 (15 Hrs.)

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   (14 Hrs.)

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   (14 Hrs.)

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.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Dr. Ashok Kumar	The Internet of Things	Vayu education of India	2025, 1st Edn
2	Shriram K Vasudevan RMD Sundaram , Abhishek S Nagarajan	Internet of Things	Wiley	2024,3rd Edn
3	Raj Kamal	Internet of Things (IOT): Architecture And Design Principles	McGraw- Hill	2022, 2nd Edn

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Jeeva Jose	Internet of Things	Khanna Book Publishing	2018, 1st Edn
2.	Prof. Satish Jain, Shashi Singh	Internet of Things (IOT) & Its Applications	BPB Publications	2020, 1st Edn

Pedagogy: Lectures, Group Discussions, Case studies.

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

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

Preamble

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 includes 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 (12 Hrs)

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 (12 Hrs)

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.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Miniyi guo, Jingyu Zhou, Feilong Tang, Yao Shen	Pervasive computing: Concepts, Technologies and Applications	CRC Press	2016, 1st Edn
2	Mohammad S. Obidat, Mieso Denko, Issac Woungang	Pervasive computing and Networking	Wiley Publication	2011, 1st Edn

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Swarnalatha C., Ashok Kumar K., Dinesh Samuel S. (Editors)	Pervasive Computing Technologies for Healthcare (2 Vols.)	Springer (LNICST)	2024, 1st Edn
2	Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober	Pervasive Computing: Next Generation Platforms for Intelligent Data Collection	Elsevier/Academic Press	2022, 1st Edn

Pedagogy

Lectures, Group Discussions, Case studies

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

Course Code	Course Title	Category	L	T	P	Credits
MCS24P3	**ADBMS LAB**	**Practical**	-	-	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

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 Designers:

1. Dr. R. Kowsalya

Dr.T. **Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
MCS23P4	**BIG DATA ANALYTICS LAB**	**Practical**	-	-	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

onsumption 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. R. Kowsalya
2. Dr. S. Lakshmi Priya

Course Code	Course Title	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.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Ethem Alpaydm	Introduction to Machine Learning	The MIT Press	2020, 4th Edn

Reference Bookss

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1.	Ian Witten	Data mining: Practical Machine Learning Tools and Techniques	Morgan Kaufmann Publishers	2016, 4th Edn
2.	Tom M. Mitchell	Machine Learning	Tata McGraw-Hill, New Delhi	2017, 1st Edn
3.	Jitendra Kumar,Prof. Tahseen A. Mulla,Mohammad Haider Syed,Charanjeet Singh	Machine Learning For Absolute Beginners	Book Rivers	2023, 1st Edn

Pedagogy

Lectures, Group Discussions, Demonstrations.

Course Designers:

1. Dr. S. Lakshmi Priya
2. Dr.T.Thendral

Course Code	Course Title	Category	L	T	P	Credits
MCS23E2	**INTERNET PROTOCOLS**	Theory	58	2	-	4

Preamble

This course presents the concept of protocols in the TCP/IP suite (IP, UDP & TCP), Layering Concepts, and Routing Architectures. It also includes Internet Addressing, Mobile IP Addressing, Network Virtualization and Client Server model of interaction.

Prerequisite

- Computer Networks
- Basic Concept of Networking

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concept of protocols in the TCP/IP suite, Protocol Layering, Routing Architecture.	K2
CLO2	Apply TCP/IP in the Mobiles.	K3
CLO3	Analyze the relation between the various internet protocols.	K4
CLO4	Evaluate the suitability of an internet protocol for Supporting a given application type.	K5
CLO5	Deploy the overlay networks.	K6

Mapping with Programme Learning Outcomes

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

S – Strong;M –Medium;L -Low

Syllabus
UNIT I **(11 Hrs)**

Introduction and Overview: The TCP/IP Internet – Internet services – History and Scope of the Internet – Internet Architecture Board-Transition to IPv6 - Relationship between IPv4 and IPv6-IPv6 Migration, Overview of Underlying Network Technologies: Two Approaches to Network Communication – WAN and LAN–Ethernet –Wi-Fi - ZigBee – OC and POS-Bridging–Congestion and Packet Loss, Internetworking Concept and Architectural Model: Application-Level Interconnection – Network Level Interconnection – Internet Architecture – Interconnection of Multiple Networks with IP Routers, Protocol Layering: Reference Model - ISO 7 Layer - TCP/IP 5 Layer.

UNIT II (11 Hrs)

Internet Addressing: IPv4 - Classful Addressing Scheme - Subnet Addressing - Classless Addressing Scheme- Classless Addressing Example- IPv6 Addressing Scheme- Embedding IPv4 Addresses IPv6 for Transition- Special Addresses- Weaknesses in Internet Addressing, Mapping Internet Addresses of Physical Addresses (ARP), Internet Protocol: Connectionless Datagram Delivery: Connectionless Delivery System Characteristics

– IP Datagram – Datagram Encapsulation – Fragmentation – Reassembly.

UNIT III (12 Hrs)

Internet protocol: Forwarding IP Datagrams, Error and Control Messages: Internet Control Message Protocol - Error Reporting Vs. Error Correction - ICMP Message Delivery - ICMP Message Format – Example ICMP Message Types Used with IPv4 & IPv6, User Datagram Protocol, Reliable Stream Transport Service (TCP): Properties of the Reliable Delivery Service – Sliding Window Paradigm - Transmission Control Protocol - Layering, Ports, Connections and Endpoints -Segment Format - Checksum Computation.

UNIT IV (12 Hrs)

Routing Architecture: Origin of Forwarding Tables - Forwarding With Partial Information - Internet Architecture and Cores –Distance Vector(Bellman-Ford) Routing – Link State(SPF)Routing, Routing Among Autonomous Systems : Scope Of A Routing Update Protocol - Autonomous System Concept - Exterior Gateway Protocols And Reachability – BGP, Routing Within an Autonomous System : Static Vs. Dynamic Interior Routes – Routing Information Protocol(RIP) – Open SPF Protocol(OSPF) - IS-IS Route Propagation Protocol.

UNIT V (12 Hrs)

Mobility And Mobile IP : Mobility, Addressing, and Routing - Mobility Via Host Address Change – Mobility Via Changes In Datagram Forwarding – Mobile IP Technology- Mobile IP Operation- Mobile IPv4 Addressing - IPv6 Mobility Support - Datagram Transmission, Reception, and Tunnelling - Assessment Of IP Mobility And Unsolved Problems , Network Virtualization: Virtual Private Networks (VPNs) - VPN tunnelling and IP- in-IP Encapsulation- VPN Addressing And Forwarding - Network Address Translation (NAT) - Example Of NAT Translation - Overlay Networks - Multiple Simultaneous Overlays, Client-Server Model of Interaction.

Text Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	DouglasE. Comer	Internet working with TCP/IP Principles, Protocols and Architecture	Pearson Publications	2014, 6th Edn
2	Behrouz A. Forouzan	TCP/IP protocol Suite1	Tata McGraw-Hill	2016, 1st Edn
3	James Wemette	TCP/IP Model: Network Protocol Fundamentals	Prentice Hall of India	2024, 1st Edn
4	Olivier Bonaventure	Computer Networking: Principles, Protocols and Practice	Open Textbook	2023, 1st Edn

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Richard Stevens	TCP/IP Illustrated	Prentice Hall of India	2011, 2nd Edn
2	Julie C. Gaffin	Internet Protocol6	Nova Science	2007, 1st Edn

Pedagogy

Lectures, Case Studies, Group Discussions.

Course Designers:

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

Course Code	Course Title	Category	L	T	P	Credits
MCS25E3	**INFORMATION RETRIEVAL**	Theory	58	2	-	4

Preamble

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
- Data Mining

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

Text Book

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Christopher D.Manning, Prabhakar Raghavan, Henrich Schutze	Introduction to Information Retrieval	Cambridge University Press	2018, 1st Edn
2	Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack	Information Retrieval	MIT Press	2025, 1st Edn

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	K. S. Jones, S. D. Dumais (Editors)	Modern Information Retrieval: Guide Books	ACM Press	2024, 1st Edn
2	Dr Ricardo Baeza-Yateset.al	Modern Information Retrieval: The Concepts and Technology	Addison Wesley	2012, 1st Edn
3	David A.Grossman andophir Frieder	Information Retrieval	Universities Press	2010, 1st Edn

Pedagogy: Lectures, Demonstrations, Guest Lectures, Video Lectures

Course Designers:
1. Dr. R. Kowsalya
2. Dr.T.Thendral

Course Code	Course Title	Category	L	T	P	Credits
MCS25E4	SOFT COMPUTING	Theory	58	2	-	4

Preamble

This course aims to explain importance of optimization techniques and genetic programming and to gather knowledge about various hybrid soft computing techniques and apply in real time problems.

Prerequisite

Basic knowledge of problem solving and networking.

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 soft computing and their applications	K2
CLO2	Apply supervised and unsupervised learning in neural networks	K3
CLO3	Analyze soft computing techniques for small applications	K4
CLO4	Evaluate the results of knowledge base system	K5
CLO5	Designs of computing techniques suitable for real time applications	K6

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium; L-Low

Syllabus

UNIT I **(11 Hrs)**

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II (11 Hrs)

Neural Networks Back Propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization- Hamming Neural Network- Hopfield Neural Network-Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks- Support Vector Machines-Spike Neuron Models

UNIT III (12 Hrs)

Fuzzy system Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations – Membership Functions- Defuzzification – Fuzzy Arithmetic and Fuzzy Measures – Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making

UNIT IV (12 Hrs)

Genetic Algorithm Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators- Cross Over – Inversion and Deletion –Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm

UNIT V (12 Hrs)

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR- Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP-Fuzzy Art Map: A Brief Introduction-Soft Computing Tools- GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller.

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	S.Rajasekaran, G.A.Vijayalakshmi Pai	Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications	PHI Learning Pvt.Ltd	2017, 1st Edn
2	S.N.Sivanandam S.N.Deepa	Principles of Soft Computing	S.K. Katria & Sons	2017, 2nd Edn
3	Vinoth Kumar, R.Saravana Kumar	Neural Networks and Learning Machines	Prentice Hall of India	2011, 1st Edn
4	Sudan Jha, Shubhabrata Datta (Editors)	Soft Computing in Smart Manufacturing and Materials	Elsevier	2025, 1st Edn
5	S. Gupta, A. Kumar Saini, T. Zia (Editors)	Soft Computing Principles and Integration for Real-Time Service-Oriented Computing	Routledge	2025, 1st Edn

Pedagogy: Lectures, Group Discussions, Case studies

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

Course Code	Course Title	Category	L	T	P	Credits
MCS25E5	BIOINFORMATICS	Theory	58	2	-	4

Preamble

This course presents the basic concepts of Bioinformatics integrates biology, computer science, and statistics to analyze, interpret, and manage biological data. It explores Sequencing, DNA and Protein Structure.

Prerequisite

- Basic knowledge of molecular biology (DNA, RNA, proteins) and genetics.
- Fundamental understanding of computer science concepts, algorithms, and programming

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts, scope and applications of Bioinformatics.	K2
CLO2	Apply various biological databases for data retrieval and analysis	K3
CLO3	Analyze sequence similarity using appropriate bioinformatics tools and techniques	K4
CLO4	Evaluate sequence alignment methods and interpret alignment results effectively	K5
CLO5	Design and visualize the structural models of proteins and DNA using computational tools	K6

Mapping with Programme Learning Outcomes

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

S – Strong; M – Medium

Syllabus

UNIT I (12 Hrs.)

Introduction to Bioinformatics – Goal – Scope – Applications – Limitations. Biological Databases: Introduction to Database – Types of Database – Biological Database – Pitfalls of Biological Database – Information retrieval from Biological databases.

UNIT II (11 Hrs.)

Database Similarity Searching: Unique Requirements of database searching – Heuristic database searching – Basic local alignment search tool (BLAST) – FASTA – Comparison of FASTA & BLAST – Database searching with smith – waterman method.

UNIT III (12 Hrs.)

Sequence Alignment: Pairwise Sequence Alignment: Evolutionary basis – Sequence Homology versus sequence Similarity- Sequence Similarity versus Sequence Identity – Methods. Multiple Sequence Alignment: Scoring Function, Exhaustive Algorithms.

UNIT IV (12 Hrs.)

Protein Structure Basics: Amino Acids- Peptide Formation-Secondary Structure - Tertiary Structure. Protein Secondary Structure Prediction: Secondary structure prediction for Globular Proteins. Tertiary Structure Prediction: Methods-Homology modeling. Protein Structure Visualization, Comparison and classification.

UNIT V (11 Hrs.)

Bioinformatics in pharmacy: Drug Discovery Process, Structure based and Ligand based drug design (CADD). Bioinformatics in agriculture: Meta Genomics: Crops, Insect Resistance, Nutritional Quality and Abiotic Stress Tolerance. Microarray Expression Data Analysis using Bayesian MethodologiesTools: Multi Alignment (T-Coffee, Muscle) Phylogenetic Analysis Tools (ODEN, Tree View).

Text Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Jin Xiong	Essential Bioinformatics	Cambridge University Press	2016, 1st Edn
2	T K Attwood & D J Parry Smith	Introduction to Bioinformatics	Pearson Education	2007, 1st Edn
3	Gautam B. Singh	Fundamentals of Bioinformatics and Computational Biology	Springer International Publishing	2025, 1st Edn

Reference Books

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR & EDITION
1	Jean-Michel Claverie , Cedric Notredame	Bioinformatics – A Beginner's Guide	Wiley Computer Publishing	2009, 1st Edn
2	Shuba Gopal, Rhys Price Jones, Paul Tymann, Anne Haake	Bioinformatics with fundamentals of Genomics and Proteomics	Tata McGraw Hill	2010, 1st Edn

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz

Course Designers
1. Dr.T.Thendral
2. Dr.R.Kowsalya