



SARDAR PATEL UNIVERSITY, BALAGHAT

School of Engineering and Technology

Syllabus

Course: M.Tech

Semester: III

Branch: Computer Science and Engineering

w.e.f. Academic Session: 2024-25

MCSE301 Data Mining

Course Objectives:

1. To provide a comprehensive understanding of the fundamental concepts, techniques, and processes involved in data mining.
2. To teach methods for data preprocessing, including cleaning, transformation, and reduction to prepare data for analysis.
3. To explore various data mining techniques such as classification, clustering, association rule mining, and anomaly detection.

Unit I: Data Warehousing:

Introduction, to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:- Dependent Data Marts, Independents Data Marts & Distributed Data Marts, Conceptual Modeling of Data Warehouses:-Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model & Aggregates.

Unit II: Online Analytical Processing:

OLAP, Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP & OLTP, OLAP Servers:- ROLAP, MOLAP, HOLAP Queries.

Unit III: Data Mining:

Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing :- Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics. Guidelines for Successful Data Mining.

Unit IV: Association Rule Mining:

Association Rule Mining Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning(DHP),Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation(FP-Growth),Performance Evaluation of Algorithms.

Unit V: Classification:

Classification Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis:- Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods:- Partitional Methods, Hierarchical Methods, Density-



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Based Methods, Dealing with Large Databases. Quality and Validity of Cluster Analysis Methods.

Reference Books:

1. Berson: Data Warehousing & Data Mining & OLAP, TMH
2. Jiawei Han and Micheline Kamber, Data Mining Concepts & Techniques, Elsevier Pub.
3. Arun.K.Pujari, Data Mining Techniques, University Press.
4. N.P Gopalan: Data Mining Technique & Trend, PHI
5. Hand, Mannila & Smith: Principle of Data Mining, PHI
6. Tan, Introduction to Data Mining, Pearson Pub.

Course Outcome:

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

1. Describe the key concepts and processes involved in data mining.
2. Implement data preprocessing techniques to prepare datasets for analysis.
3. Utilize various data mining techniques, including classification, clustering, and association rule mining.
4. Identify current trends and future research directions in data mining.



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Elective-I MCSE3021 Network Security

Course Objectives:

1. Understand encryption techniques (symmetric and asymmetric).
2. Learn about classical and modern encryption methods (e.g., DES, RSA, AES).
3. Study hash functions, message authentication, and digital signatures.
4. Understand and apply network security protocols (e.g., IPsec, SSL/TLS).
5. Explore intrusion detection, prevention, and firewall design.

Unit I: Conventional Encryption:

Conventional Encryption: Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of operation, Conventional Encryption algorithms Public Key Encryption And Hash Functions.

Unit II: Public Key Cryptography:

Public Key Cryptography, Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Cryptography Message Authentication and Hash Functions Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions. Hash And Mac Algorithms MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-I), RIPEMD, HMAC

Unit III: Digital Signatures:

Digital Signatures and Authentication Protocols, Digital Signatures, Authentication Protocols -Digital Signature Standard Authentication Applications, IP Security, Web Security

Unit IV: Intruders:

Intruders, Viruses and Worms Intruders, Viruses and Related Threats

Unit V: Firewalls:

Firewall, Firewall Design Principles, Trusted Systems

Reference Books:

1. William Stallings, "Cryptography and Network Security", Second edition, Prentice Hall, 1999.
2. Atul Kahate, "Cryptography and Network Security," TMH
3. William Stallings, "Cryptography and Network Security", Third Edition, Pearson Ed.
4. Introduction to network security, Krawetz, Cengage
5. Charles Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Fifth Edition, Prentice Hall, 2015.



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Course Outcome:

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

1. Apply cryptographic algorithms (DES, RSA, AES) for secure communication.
2. Implement hash functions and message authentication codes (HMAC).
3. Use digital signatures for authentication and data integrity.
4. Design secure network systems using encryption and public key cryptography.
5. Detect and mitigate security threats like intrusions and malware.
6. Configure and manage firewalls for network security.



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Elective-I MCSE3022 Data Science & Big Data

Course Objectives:

1. To provide a comprehensive understanding of the fundamental concepts, techniques, and tools used in data science.
2. To teach methods for data collection, cleaning, and preprocessing to prepare data for analysis.
3. To understand the principles and technologies used in big data, including distributed computing and storage solutions.
4. To analyze real-world applications of data science and big data in various domains, such as healthcare, finance, and marketing.

Unit I: Understanding Data:

Understanding Data: Data Wrangling and Exploratory Analysis, Data Transformation & Cleaning, Feature Extraction, Data Visualization. Introduction to contemporary tools and programming languages for data analysis like R and Python.

Unit II: Analysis of Data:

Statistical & Probabilistic analysis of Data: Multiple hypothesis testing, Parameter Estimation methods, Confidence intervals, Bayesian statistics and Data Distributions.

Unit III: Machine Learning:

Introduction to machine learning: Supervised & unsupervised learning, classification & clustering Algorithms, Dimensionality reduction: PCA & SVD, Correlation & Regression analysis, Training & testing data: Over fitting & Under fitting.

Unit IV: Information Retrieval:

Introduction to Information Retrieval: Boolean Model, Vector model, Probabilistic Model, Text based search: Tokenization, TF-IDF, stop words and n-grams, synonyms and parts of speech tagging.

Unit IV: Web Search & Big Data:

Introduction to Web Search & Big data: Crawling and Indexes, Search Engine architectures, Link Analysis and ranking algorithms such as HITS and Page Rank, Hadoop File system & Map Reduce Paradigm.

Text Books:

1. Field Cady, "The Data Science Handbook", 1/e, 2018, Publisher: Wiley
2. Sinan Ozdemir, "Principles of Data Science", 1/e, 2016, Packt Publishing Limited



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Reference Books:

1. Peter Bruce, “Practical Statistics for Data Scientists: 50 Essential Concepts”, Shroff/O'Reilly; First edition, 2017
2. Pang-Ning Tan, “Introduction to Data Mining”, Pearson Edu.
3. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education.

Course Outcome:

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

1. Describe the key concepts and techniques used in data science and big data.
2. Implement methods for data collection, cleaning, and preprocessing to prepare datasets for analysis.
3. Work with big data technologies, such as Hadoop and Spark, to handle and analyze large datasets.
4. Analyze case studies and evaluate the impact of data science solutions in various industries.