MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005
(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V. Bhopal, M.P.)

Department of Computer Science & Engineering and Information Technology

DATABASE SYSTEMS
620111/630111

UNIT I

Review of Databases: Characteristics & Implications of Database Approach, Data Models, Architectures, Database Languages & Interfaces, Classification of DBMS, Data Independence, ER-Models, High Level Conceptual Data Models, Relationships, ER-Diagrams, Design Issues.

UNIT II

Object Oriented and Extended Relational Databases: Concepts of Object Oriented Databases, Object Identity, Object Structure and Type Constructors, Encapsulation of Operations, Methods & Persistence, Type Hierarchies and Inheritance, Object Database Standards, Object Definition Language, Object Query Language and Object Database Conceptual Design.

UNIT III

Distributed Databases: Concepts, Fragmentation, Replication, Allocation Techniques for Distributed Database Design, Types of Distributed Database Systems, Query Processing, Concurrency Control and Recovery, Distributed Databases in Oracle.

UNIT IV

Transaction Processing: Introduction, Transaction and System Concepts, Properties of Transactions, Schedules & Recoverability, Serializability of Schedules, Transaction Support in SQL, Concurrency Control Techniques: Locking Techniques, Time Stamp Ordering, Multi Version Concurrency, Validation Concurrency, Locks for Concurrency Control.

UNIT V

Image and Multimedia Databases: Modeling and Storage of Image and Multimedia Data, Data Structures- R-Tree, k-d Tree, Quad Trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, WEB Database: Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems, Mobile Databases, Case Study: Oracle Xi

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Recommended Books:

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamental of Database Systems", 4th Edition , Pearson Education, 2007
2. R. Ramakrishanan, "Database Management Systems", McGraw Hill International Editions, 1998
3. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
4. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: recall the fundamental of RDBMS, DBMS storage structures and access techniques.

CO2: illustrate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO3: make use of various concurrency control mechanisms for error free transaction processing.

CO4: analyze various types of databases.

CO5: design ER-models to represent simple database application scenarios and improve the database design by normalization.

CO6: propose the improved data-intensive application using DBMS APIs program.

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Department of Computer Science & Engineering and Information Technology

DISTRIBUTED COMPUTING
620112/630112/640112

UNIT I

Introduction To Distributed System, Communication: Layered Protocols, Client Server Protocols, RPC, Group Communication, Coordination, Synchronization & Consistency: Logical Clocks, Physical Clocks, Mutual Exclusion, Election Algorithms, Atomic Broadcast, Sequential Consistency Transaction Distributed Consensus, Threads: Thread Synchronization, Implementation Issues and Threads Vs RPC.

UNIT II

Models Of Distributed Computing: Client Server and RPC, RPC Architecture, Exceptions, Underlying Protocols, IDL, Marshalling Etc. Group Models and Peer to Peer: Groups for Service Replication/ Reliability, Groups For Parallelism/ Performance, Client/ Server Vs. Peer-To-Peer, Multicast, Atomic Broadcast.

UNIT III

Distributed File System: Security, Naming/ Location Transparency, R/W Semantics, Cache Coherence, Replication. Distributed Shared Memory: DSM Architecture, Consistency Models and Relation to Caching, Release Consistency, Comparison with Message Passing and RPC.

UNIT IV

Fault Tolerant Distributed Systems: Introduction, Dependability, Faults Vs. Errors Vs. Failure, Space Time and Value Redundancy, Fault Tolerant Architecture, Failure Detection Algorithms, Partitioning, FT Consensus.

UNIT V

Distributed Multimedia System: Introduction, Characteristics, And Resource Management Stream Adaptation, Security: Introduction, Security Techniques, Cryptographic Algorithms, Authentication and Access Control, Case Study: CORBA, MACH.

Recommended Books:

1. Andrew S Tanenbaum, Distributed Systems: Principles and Paradigms, Pearson
2. Pradeep K. Sinha, Distributed Operating Systems, PHI

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: demonstrate knowledge of the basic elements and concepts related to distributed system technologies

CO2: summarize various architectures used to design distributed systems.

CO3: build distributed systems using various inter process communication techniques.

CO4: analyze a problem and form a distributed system to work towards a solution.
CO5: explain various distributed algorithms, such as logical clocks and leader election.
CO6: propose own reflections and attitudes in regard to the area of research.

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Department of Computer Science & Engineering and Information Technology

HIGH-SPEED NETWORKS
620113/630113/640113

UNIT I

Review of Networking and Networking Protocols, TCP/IP Model, OSI Model, Internet Protocols and Addressing, Routing and Internetworking: Network–Layer Routing, Congestion Control at Network Layer, Logical Addressing: IPv4 Addresses, IPv6, Multicasting Techniques and Protocols.

UNIT II

Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control, Application Layer: Principles of Network Applications, Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS).

UNIT III

Optical Networks and WDM Systems: Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength Allocation in Networks. WDM Network elements: Optical line terminals and amplifiers.

UNIT- IV

ATM-based Services and Applications, ATM Switching, ATM Transmission, Wireless ATM and mobile ATM, Security in ATM network, VPNs: Introduction, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Overlay Networks – VoIP.

UNIT- V

Mobile Ad-Hoc Networks: Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks – Wireless Sensor Networks: Sensor Networks and Protocol Structures.

Recommended Books:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill, 2007
2. Computer Networks, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall
3. Adhoc Wireless Networks: Architecture & protocols, Sivaram Murthy, PHI
4. Optical Networks: Third Generation Transport Systems, Uyless Black, Pearson
5. Optical Networks: A Practical Perspective, Rajeev Ramaswami and N. Sivarajan, Morgan Kaufmann
6. ATM Networks: Concepts, Protocols, Applications, Rainer Handel, Huber and Schroder, Pearson

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COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: recall the understanding of network engineering principles for network, system and service management

CO2: classify the theoretical and practical concepts behind the design of multi-constained applications and the need for service integration.

CO3: apply the knowledge of Advanced Network Engineering including design, routing, management, security, performance and ability to understand and use industry standard tools used.

CO4: solve the problems associated with network design, routing, management, security and performance.

CO5: analyze the concepts underlying different protocols, QoS architectures and mechanisms and their main characteristics and functionality.

CO6: assess the network management issues and devise adequate network management solutions using industry design techniques/possible research opportunities.

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NETWORK SECURITY
620116

UNIT I

Introduction to security attacks, services and mechanism, introduction to cryptography Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers, Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality

UNIT II

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, ElGamal encryption.

UNIT III

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS).

UNIT IV

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, Secure Electronic Transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

UNIT V

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME. Security in WLAN: Security mechanisms: WEP, WPA, Radius, CHAP, EAP, 802.11i

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Recommended 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.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: define computer security and basics of cryptography.

CO2: demonstrate different data encryption algorithms and keys used during encryption techniques.

CO3: identify the various security attacks and threats.

CO4: analyse evaluation criteria for AES, Triple DES and Traffic Confidentiality.

CO5: explain SSL and TSL, Firewall, Digital Signatures and its standards & schemes and the enhancements made to IPv4 by IPsec.

CO6: discuss various web security considerations.

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MACHINE LEARNING USING PYTHON
620120/630120/640120

COURSE OBJECTIVES:

- To learn the basic construct of python programming for implementing various Machine Learning algorithms.
- To understand the basic concepts of Machine Learning.
- To use Machine Learning concepts and algorithms for real-world problem solving.

Unit – I

Introduction to Python Programming: Setting up Programming Environment, Running Python Programs from a Terminal, Variables and Simple Data Types: Numeric, String, List, Tuple, Dictionary, Set, Boolean, Conditional Statements and Loops, Lambda Functions; Various inbuilt Functions; Read Write Operations in Files; using Python Packages and Modules.

Unit – II

Data Processing and Visualization: Introduction to Pandas, Installation, Reading CSV Files and Performing Various Operations: Slicing, Merging, Concatenation on Various Datasets. Introduction to Numpy, Vector Representation, Basic Operations on N-Dimensional Matrices using Numpy. Data Visualization using Matplotlib, Plotting Various Types of Graphs: Line, Bar, Scatter, Histogram and Pie-Charts.

Unit – III

Introduction to Machine Learning: Basic Principles, Applications, Challenges; Supervised, Unsupervised and Reinforcement Learning Approaches; Basic Steps of Machine Learning: Data Collection, Data Preparation, Choosing a Learning Model, Training a Model, Evaluation of Model, Parameter Tuning and Prediction.

Unit – IV

Supervised Learning: Linear Regression, Gradient Descent, Features, Overfitting, Regularization and Complexity, Training, Validation, Testing Data, Performance Matrices: Mean Squared Error(MSE), Root-Mean-Squared-Error(RMSE), Mean-Absolute-Error(MAE), R^2 or Coefficient of Determination; Multivariate Regression; Applications of Regression. **Classification:** Binary, Multi-Class and Multi-Label Classification; Applications: Logistic Regression, K-Nearest Neighbour, Decision Trees, Random Forests, Support Vector Machines and Neural Networks; Comparison Matrix.

Unit – V

Unsupervised Learning: Clustering and Association Problems; Applications; K-

Means, DBSCAN, Principal Component Analysis, Apriori Algorithm for Association Rule Learning Problems, Machine Learning Model Building on Various Datasets available on Kaggle and UCI Repositories using Python Machine Learning Library Scikit-Learn.

RECOMMENDED BOOKS:

- John Hunt, A Beginners Guide to Python 3 Programming, Springer, 1st Edition, 2019.
- Learn Python the Hard Way, 3rd Edition
- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes
- Andreas C. Müller, Sarah Guido, Introduction to Machine Learning with Python, O'Reilly Media, Inc, 2016.
- Aurélien Géron, Hands-On Machine Learning with Scikit-Learn and TensorFlow, O'Reilly Media, Inc, 2017.

COURSE OUTCOMES:

After completion of this course, the students would be able to.

CO1. define basic concepts of machine learning.

CO2. summarize various concepts of python programming, data processing and visualization.

CO3. apply machine learning algorithms to solve real world problems using python programming.

CO4. compare machine learning algorithms for applicability and performance analysis

CO5. assess various open source datasets and estimate the most suitable machine learning model for prediction process.

CO6. build machine learning models on open source datasets using python machine learning library.
