SARDAR PATEL UNIVERSITY, BALAGHAT
School of Engineering and Technology
Syllabus

Course: M.Tech   **Semester: II**

Branch: Computer Science and Engineering   **w.e.f. Academic Session: 2024-25**

MCSE201 Web Technology & E-Commerce

Course Objectives:

1. To provide a comprehensive understanding of the fundamental technologies and frameworks used in web development.

2. To teach Client-side Scripting languages and technologies, including HTML, CSS, and JavaScript

3. To introduce security best practices and performance optimization techniques in web applications.

4. Understand the fundamental concepts of e-commerce and online business models.

5. Learn the structure of online payment systems and shopping carts.

Unit I: Internet and Networking:
Introduction to building blocks of electronic commerce: Internet and networking. Technologies, IP addressing, ARP, RARP, BOOTP, DHCP, ICMP, DNS, TFTP, TELNET.

Unit II: Web Technology Concepts:
Static and dynamic web pages, tiers, plug-ins, frames and forms. Exposure to Markup languages, HTML, DHTML, VRML, SGML, XML etc. CGI, Applets & Serve-lets, JSP & JAVA Beans, active X control, ASP cookies creating and reading cookies, semantic web, semantic web service ontology Comparative case study of Microsoft and JAVA technologies, web server scalability. Distributed objects, object request brokers, component technology, Web services, Web application architectures, Browsers, Search engines

Unit III: E-Commerce Basics:
Electronic Commerce and physical Commerce, Different type of e-commerce, e-commerce scenarios, advantages of e-commerce. Business models: Feature of B2B e-commerce, Business models, Integration. E-Services: category of e-services, Web- enabled services, Matchmaking services, information-selling on the web.

Unit IV: Introduction to Payment System:
Internet payment system: Characteristics of payment system, 4C payments methods, SET Protocol for credit card payment, E-cash, E-check, Micro payment system, Overview of smart card, overview of Mondex. E-Governance: E-Governance architecture, Public private partnership, Readiness, Security, Cyber Crime and Law, IT Act

Unit V: E-Commerce Technologies:
Advanced technologies for e-commerce: Introduction to mobile agents. WAP: the enabling technology: The WAP model, WAP Architecture, Benefit of WAP to e-commerce. Web Security, Encryption Schemes, Secure Web documents, Digital signatures and firewalls.

Reference Books:

1. Web Technology, Achyut Godbole, Atul Kahate, TMH
2. Henry Chan, Raymond Lee, Tharam Dillon , E-Commerce Fundamental and applications, Willey Publication.
3. Minoli & Minoli, Web Commerce Technology Hand Book, TMH
4. Satyanarayana, E-Government, PHI
5. Uttam K: Web Technologies, Oxford University Press.
6. G. Winfield Treese, Lawrence C. Stewart, Designing Systems for Internet Commerce, Longman Pub.
7. Charles Trepper, E Commerce Strategies, Microsoft Press

Course Outcome:

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

1. Explain the key technologies and frameworks used in modern web development.

2. Develop interactive client-side features using HTML, CSS, and JavaScript.

3. Create user-friendly and responsive web interfaces that adhere to design principles.

4. Identify and explain different types of e-commerce business models (B2C, B2B, etc.).

5. Implement security measures for user data protection and secure online transactions.

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MCSE202 Cryptography

Course Objectives:

1. To impart knowledge of the basic principles and concepts of modern cryptography.

2. To provide students with a solid foundation in the principles and concepts of cryptography and its role in Cyber Security.

3. To enable students to understand and implement various cryptographic algorithms and protocols, both symmetric and asymmetric.

Unit I: Introduction:

Modern cryptography, Historical ciphers and their cryptanalysis, The heuristic versus the rigorous approach; adversarial models and principles of defining security, Perfectly-Secret Encryption: Definitions, the one-time pad; proven limitations. Private-Key (Symmetric) Encryption: Computational security, Defining secure, encryption, Constructing secure encryption; pseudo randomness, Stronger security notions, Constructing CPA-secure encryption, Modes of operation; CBC vs. CTR, Security of CTR with $n - k$ bit counter for messages to size 2k blocks with proof directly to the LR definition, CCA attacks.

Unit II: Message Authentication Codes:

Message Authentication Codes: Message integrity, Definition of security, Constructions from pseudorandom functions, CBC-MAC, Authenticated Encryption.

Unit III: Collision-Resistant Hash Functions:

Definitions, The Merkle-Damgard transform, HMAC, Birthday attacks, The Random oracle model, Password hashing, Constructions of Pseudorandom Permutations (Block Ciphers) in Practice, Substitution-permutation and Feistel networks, DES and attacks on reduced-round versions, double-DES and triple-DES, AES, Hash functions from block ciphers.

Unit IV: Number Theory:

Preliminaries and basic group theory, Primes, factoring and RSA, Cryptographic assumptions in cyclic groups, Collision resistant hash functions from discrete log.

Unit V: Public-Key (Asymmetric) Cryptography:

Introduction to Public Key Cryptography, Diffie-Hellman Key Exchange,

Public-Key (Asymmetric) Encryption: The model and definitions, Hybrid encryption and KEM/DEM, El Gamal, RSA: textbook encryption, attacks on textbook RSA, padded RSA; CCA-secure RSA KEM. Digital Signatures: Definition and applications, Hash and sign, RSA signatures: textbook RSA, hashed RSA, security with ROM, Certificates and public-key infrastructures.

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Reference Books:

1. Jonathan Katz and Yehuda Lindell, Introduction to Modern Cryptography, second edition 2014, CRC Press.
2. Cryptography: Theory and Practice by Douglas Stinson, Third edition, CRC Press.
3. Handbook of Applied Cryptography by Alfred Menezes, Paul Oorschot and Scott Vanstone. Available Online.
4. Foundations of Cryptography by Oded Goldreich. Available Online.
5. Cryptography, an Introduction by Nigel Smart. Available Online

Course Outcome:

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

1. Explain fundamental concepts of cryptography, including encryption, decryption, keys, and cryptographic protocols.

2. Demonstrate proficiency in implementing symmetric and asymmetric encryption algorithms (e.g., AES, RSA) and cryptographic hash functions (e.g., SHA-256).

3. Apply cryptographic principles to real-world scenarios, including secure data transmission, digital signatures, and authentication mechanisms.

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MCSE203 Advance Concept in Databases

Course Objectives:

1. Gain advanced knowledge of database models, including relational, hierarchical, network, and object-oriented databases.

2. Understand the internals of database management systems (DBMS), including storage structures and data retrieval techniques.

3. Study the concepts behind distributed databases, including data fragmentation, replication, and consistency models.

4. Study the concepts behind distributed databases, including data fragmentation, replication, and consistency models.

Unit I: DBMS Introduction:
DBMS Concept Introduction, Data Model, Entity & Attributes, Relationship, E-R Model, Relational Data Model, Domain Tuples, Attributes, Key, Schema, Integrity Constraints, Relational Algebra & Relational Calculus, Normalization & Normal Form.

Unit II: Query Processing:
Query Processing and Optimization Introduction, Query Processing, Syntax Analyzer, Query Decomposition: - Query Analysis, Query Normalization, Semantic Analyzer, Query Simplifier, Query Restructuring. Query Optimization, Cost Estimation in Query Optimization, Structure of Query Evaluation Plans, Pipelining and Materialization.

Unit III: Distributed Database:
Distributed Databases Introduction, Architecture of Distributed Databases, Distributed Database System Design, Distributed Query Processing, Concurrency Control in Distributed Databases, Recovery Control in Distributed Databases. Web Databases, Multimedia Databases, Spatial Databases, Clustering- based Disaster-proof Databases, Mobile Databases.

Unit IV: OODBMS:
Object-Oriented Databases Introduction, Concept of Object Oriented Database, Object Oriented Data Model (OODM), Object-Oriented DBMS (OODBMS), Object Data Management Group and Object-Oriented Languages. Object-Relational DBMS, ORDBMS Design, ORDBMS Query Language.

Unit V: Data Warehousing and Data Mining:
Design of Data Warehouse, Dimension and Measures, Data Marts and Distributed Data Marts, Conceptual Modeling of Data Warehouses:-Star Schema, Snowflake Schema, Fact Constellations. Multi- dimensional Data Model & Aggregates.
Data Mining: Data, Information and Knowledge Discovery, Data Mining Functionalities, Data

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Mining System categorization and its Issues. Data Processing, Data Reduction, Data Mining Statistics. Data Mining Techniques.

Reference Books:

1. C. J. Date: An Introduction to Database Systems , Addison-Wesley
2. Avi Silberschatz, Henry F. Korth, S. Sudarshan, Data Base System Concepts, TMH
3. Patrick O'Neil & Elizabeth O'Neil, Database Principles, Programming and Performance, Morgan Kaufmann Hardcourt India
4. Gillenson, Fundamental of Data Base Management System, Willey India
5. Ceri & Pelagatti, Distributed Databases Principles & Systems, TMH
6. Paulraj Ponniah, Data Ware Housing Fundamental, Willey India.
7. Jiawei Han, Data Mining Concept & Techniques, Elsevier Pub.

Course Outcome:

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

1. Understand the differences and use cases for hierarchical, network, object-oriented, and other specialized databases.

2. Implement and manage distributed databases, understanding data fragmentation, replication, and consistency in a distributed environment.

3. Design databases for high performance, using indexing, clustering, and partitioning techniques.

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MCSE204 Block Chain Technology

Course Objectives:

1. Introduce students to the basic principles and concepts of block chain technology, including its history and evolution.

2. Explain the role of cryptography in ensuring the security and integrity of block chain networks.

3. Explore real-world applications of block chain technology across various industries such as finance, supply chain, and healthcare.

4. Discuss the legal, regulatory, and ethical issues surrounding block chain technology and its applications.

Unit I: Introduction:
Overview of Block chain, Public Ledgers, Bit coin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic crypto-currency.

Unit II: Understanding Block Chain with Crypto Currency:
Understanding Block chain with Crypto currency: Bit coin and Block chain: Creation of coins, Payments and double spending, Bit coin Scripts, Bit coin P2P Network, Transaction in Bit coin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bit coin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hash Cash PoW, Bit coin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bit coin Miner, Mining Difficulty, Mining Pool.

Unit III: Understanding Block Chain for Enterprises:
Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for Permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport- Shostak- Pease BFT Algorithm, BFT over Asynchronous systems.

Unit IV: Enterprise application of Block chain:
Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Block chain.

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Unit V: Block Chain Application Development:

Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

References:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015
2. Josh Thompsons, "Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming"
3. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017
4. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
5. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing
6. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer", Import, 2018.

Course Outcome:

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

1. Explain the fundamental concepts and components of block chain technology and its significance in modern computing.

2. Understand and apply basic cryptographic techniques used in block chain, such as hashing and digital signatures.

3. Analyze and evaluate the applicability of block chain technology to various real-world scenarios and industries.

4. Assess the legal, ethical, and regulatory implications of implementing block chain solutions.

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MCSE205 Soft Computing

Course Objectives:

1. To provide a foundational understanding of soft computing techniques and their applications.

2. To teach the principles and methods of fuzzy logic and its role in soft computing.

3. To introduce genetic algorithms as a method for optimization and problem-solving.

4. To analyze real-world applications of soft computing in various domains such as engineering, finance and healthcare.

Unit I: Introduction to Soft Computing:

Introduction: Introduction to soft computing, application areas of soft computing, classification of soft computing techniques, structure & functioning of biological brain & Neuron, and concept of learning/training. Model of an Artificial Neuron, transfer/activation functions, perceptron, perceptron learning model, binary & continuous inputs, linear separability.

Unit II: Multilayer Neural Networks:

Multilayer Neural Networks: Feed Forward network - significance, training, loss function, Back-Propagation algorithm, applications. Feedback network -Hopfield Nets: architecture, energy functions, training algorithms & examples, competitive learning, self-organizing maps. Introduction to CNN and RNN network.

Unit III: Fuzzy Systems:

Fuzzy Systems: fuzzy set theory, fuzzy sets and operations, membership functions, concept of fuzzy relations and their composition, concept of fuzzy Measures. Fuzzy logic: fuzzy rules, inferencing. Fuzzy Control system: selection of membership functions, Fuzzy-fication, rule based design & inferencing, Defuzzyfication, applications of fuzzy system.

Unit IV: Genetic Algorithm:

Genetic algorithm: concepts, creation of off-spring, working principle, encoding, fitness functions, reproduction, genetic modeling. Generation cycle & convergence of GA, Application areas of GA.

Unit V: Advanced Soft Computing Techniques:

Advanced soft computing techniques: Rough Set Theory - Introduction, Set approximation, Rough membership, Attributes, optimization. Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization, Particle Swarm Optimization, Bee Colony Optimization etc.

Reference Books:

1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
2. S. Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms,

Synthesis & applications, PHI Publication

3. Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH Kosko: Neural Network & Fuzzy System, PHI Publication
4. Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli., PHI Pub. Hagen, Neural Network Design, Cengage Learning

Course Outcome:

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

1. Describe key concepts and techniques in soft computing.

2. Develop fuzzy logic systems to solve real-world problems.

3. Design and implement artificial neural networks for various applications.

4. Utilize genetic algorithms for optimization problems.

5. Analyze and discuss applications of soft computing in different fields.