SARDAR PATEL UNIVERSITY, BALAGHAT
School of Engineering and Technology
Syllabus

Course: B.Tech **Semester: V**

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

CSE501 Data Communication

Course Objectives:

1. Grasp the basic concepts and principles of data communication, including types of networks and communication models.
2. Explore different types of transmission media (wired and wireless) and their impact on data communication.
3. Analyze techniques for error detection and correction to ensure reliable data transmission.

Unit I: Data Communication:

Data Communication: Introduction, Components, data representation, data flow and basic model Serial & Parallel transmission, Modes of data transmission, Encoding: Unipolar, Polar, Bipolar, Line & Block codes. Data compression: Lossy & Lossless techniques. Review of analog & digital transmission methods.

Unit II: Multiplexing:

Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous & Statistical TDM. Spread spectrum: Frequency Hopping & Direct Sequence. Terminal Handling & Polling. Network Switching Techniques: Circuit, Message, Packet & Hybrid, X.25, ISDN.

Unit III: Physical Layer:

Physical Layer: Introduction, Interface, Standards, EIA-232-D, RJ-45, RJ-11, BNC connector & EIA-449 digital Interface: Connection, specifications & configuration. Modem: Types, features, signal constellation, block schematic. Connecting Devices: Active and Passive Hubs, Repeaters, Bridges, two & three layer Switches and Gateway. Network Topologies and their comparative study.

Unit IV: Transmission Media:

Transmission Media: Transmission line characteristics, distortions, Crosstalk. Guided Media: Twisted Pair, Baseband & Broadband Coaxial, Fiber Optic Cable. Unguided media: Electromagnetic polarization , Rays and waves front , Electromagnetic spectrum, Radiation & Propagation of Waves, Inverse square law , Wave attenuation and absorption, Terrestrial Propagation, Skip distance , Radio waves, Microwave , Infrared & Satellite Communication system . Telephone Network: Components, LATAs, signaling and Services, Digital Subscriber Line: ADSL, HDSL, SDSL, VDSL, Cable TV network for data transfer.

Unit V: Transmission Errors:

Transmission Errors: Content Error , Flow integrity error , Error detection ,Error correction , Bit error rate. Error detection & Correction methods: Parity checking, Checksum Error Detection, Cyclic Redundancy Check , Hamming Distance , Interleaved codes , Block Parity , Convolution code,

Hardware Implementation, Checksum.

Text Books:

1. Gupta Prakash C. “Data communication”, PHI Learning
2. Forouzan, “Data communication and Networking”, 5e, TATA Mc Graw
3. Godbole A., “Data Communication & Network” , TMH
4. Miller, “ Data Network and Communication”, Cengage Delmar Learning
5. Stallings William, “Data & Computer Communication”, Pearson Education

Reference Books:

1. Tanenbum A.S. “Computer Network”, Pearson Education.
2. Kennedy G., “Communication Systems” MGH

Course Outcome:

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

1. Describe the fundamental concepts of data communication and the roles of various networking components.
2. Evaluate and select appropriate transmission media for different communication scenarios.
3. Implement error detection and correction techniques in data communication systems.
4. Develop strategies to enhance the security of data transmission in networks.

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CSE502 Cyber Security

Course Objectives:

1. Provide a solid understanding of the principles and concepts of cyber security, including the various types of threats and vulnerabilities.
2. Familiarize students with security tools and technologies used to protect networks, systems, and data.
3. Explore the ethical, legal, and regulatory issues surrounding cyber security, including data privacy laws.

Unit I: Introduction of Cyber Crime:
Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique.

Unit II: Web Jacking:
Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime, Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers were hacking, session hijacking.

Unit III: Cyber Crime and Criminal Justice:
Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends.

Unit IV: The Indian Evidence Act of 1872 v. Information Technology Act, 2000:
The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E- Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

Unit V: Tools and Methods in Cyber Crime:
Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and D-DoS Attacks, Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing Techniques.

Reference Books:

1. Principles of Cyber crime, Jonathan Clough Cambridge University Press
2. John R. Vacca, Computer Forensics:Computer Crime Scene Investigation, 2nd Edition, Charles

River Media, 2005
3. Cyber Law Simplified, VivekSood, Pub: TMH.
4. Cyber Security by Nina Godbole, SunitBelapure Pub: Wiley-India
5. Information Warfare: Corporate attack and defense in digital world, William Hutchinson, Mathew Warren, Elsevier.
6. Cyber Laws and IT Protection, Harish Chander, Pub, PHI.

Course Outcome:

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

1. Explain the fundamental concepts of cyber security and the importance of securing information systems.
2. Implement security measures for networks to prevent unauthorized access and attacks.
3. Understand and evaluate legal and ethical considerations in cyber security practices.

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CSE503 Artificial Intelligence

Course Objectives:

1. Introduce students to the fundamental concepts and techniques of artificial intelligence, including its history and evolution.
2. Provide an understanding of various machine learning algorithms and their applications in solving real-world problems.
3. Encourage students to develop problem-solving skills by applying AI techniques to diverse challenges.
4. Highlight the applications of AI in various fields, including healthcare, finance, robotics, and natural language processing.

Unit I: Meaning and Definition of Artificial Intelligence:
Meaning and definition of artificial intelligence, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search, A* Algorithm, AO* Algorithms and various types of Control Strategies.

Unit II: Knowledge Representation:
Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning.

Unit III: Probabilistic Reasoning:
Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Unit IV: Game Playing Techniques:
Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Unit V: Introduction to Learning:
Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

Reference Books:

1. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
2. Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.
3. Waterman D.A., A guide to Expert System, Addison Wesley, Reading (Mars).

4. Giarratand & Riley, Expert Systems: Principles and Programming, Thomson

Course Outcome:

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

1. Explain the core principles of artificial intelligence and its relevance in today's technology landscape.
2. Preprocess and analyze data to prepare it for machine learning models.
3. Utilize AI tools and frameworks to develop and deploy AI models.
4. Apply AI techniques to design solutions for real-world problems in various domains.

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CSE504 Computer Graphics & Multimedia

Course Objectives:

1. Introduce students to the basic principles of computer graphics, including the representation and manipulation of 2D and 3D graphics.
2. Teach students to implement graphics algorithms and techniques using programming languages and graphics libraries.
3. Provide an understanding of the principles of animation and how to create animated graphics.

Unit I: Introduction to Raster Scan displays:
Introduction to Raster Scan displays, Pixels, Frame buffer, Vector & Character generation, Random Scan systems, Display devices, Scan Conversion techniques, Line Drawing: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms: Midpoint Circle drawing and Bresenham's Algorithm, Polygon fill algorithm: Boundary-fill and Flood-fill algorithms.

Unit II: 2-D Transformation:
2-D Transformation: Translation, Rotation, Scaling, Shearing, Reflection, Inverse transformation Homogenous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping & Polygon Clipping Algorithms.

Unit III: 3-D Transformations:
3-D Transformations: Translation, Rotation and Scaling. Parallel & Perspective Projection: Types of Parallel & Perspective Projection, Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm. Curve generation, Bezier and B- spline methods. Basic Illumination Model: Diffuse reflection, Specular reflection, Phong Shading, Gouraud shading, Ray Tracing, Color models like RGB, YIQ, CMY, HSV.

Unit IV: Multimedia:
Multimedia: Characteristics of a multimedia presentation, Uses of Multimedia, Text –Types, Unicode Standard, text Compression, Text file formats, Audio Components of an audio system, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software, Video-Video color spaces, Digital Video, Digital Video processing, Video file formats.

Unit V: Animation:
Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation software. Compression: Lossless/Lossy Compression techniques, Image, Audio & Video Compressions, MPEG Standards ,Multimedia Architecture, Multimedia databases.

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Reference Books:

1. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
2. Donald Hearn and M.P. Becker “Computer Graphics” Pearson Pub.
3. Parekh “Principles of Multimedia” Tata McGraw Hill
4. Maurya, “Computer Graphics with Virtual Reality System “ Wiley India
5. Pakhira,”Computer Graphics, Multimedia & Animation”,PHI learning.
6. Andleigh, Thakral , “Multimedia System Design “ PHI Learning.

Course Outcome:

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

1. Explain the fundamental concepts and terminology related to computer graphics and multimedia.
2. Implement basic graphics algorithms for rendering and manipulating 2D and 3D objects.
3. Apply different rendering techniques and shading models to enhance visual quality.
4. Integrate various multimedia components (Audio, video, Graphic) into cohesive applications.
5. Design and create animated graphics using principles of animation and key frame techniques.

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Elective-I CSE5051 Object Oriented Analysis and Design

Course Objectives:

1. Teach students to use modeling techniques to represent and analyze real-world systems using UML (Unified Modeling Language).
2. Familiarize students with the software development life cycle (SDLC) and the role of OOAD in different phases.
3. Introduce common design patterns and best practices in object-oriented design to promote code reusability and maintainability.
4. Encourage the application of OOAD principles in real-world software development projects.

Unit I: Overview of Object Oriented Concepts:
Overview of Object Oriented concepts: Objects and classes, abstraction, generalization and inheritance, encapsulation, multiple inheritance, aggregation abstraction classes, polymorphism, link and association, Need for object oriented approach.

Unit II: System Design Life Cycle:
System design life cycle, object oriented S/W development process model, Object Oriented analysis, Object Modeling Technique (OMT): object model, function model, relationship among models, object diagrams, state diagrams, data flow diagrams, analysis.

Unit III: Object Oriented Design:
Object oriented Design: Overview of object design, Combination the models, Designing algorithms, design optimization, Implementation of control, Adjustment, Design of association, object representation, physical packaging, documenting design decision, comparison of use-case driven approach.

Unit IV: Translation Object Oriented Design into Implementation:
Translation Object Oriented design into implementation, Programming style, documentation, characterization of object oriented languages, Comparison of object oriented language like C++, JAVA, object programming.

Unit V: Unified Modeling Language (UML):
Unified Modeling Language (UML): Class diagram sequence diagram Use case diagram, Collaboration, diagram, state, chart diagram, Activity diagram, component diagram, deployment diagram, Object oriented Database: Relational Vs .object oriented database, the architecture of object oriented database, query language for Object Oriented database.

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Reference Books:

1. Satzinger, Jackson and Burd, "Object oriented Analysis and design with the Unified Process" CENGAGE Learning.
2. Michael Blaha and J. Rumbugh, "Object oriented Modeling and Design with UML", Pearson Education.
3. O'Docherty, "Object Oriented Analysis and Design Understanding, SystemDevelopment with UML2.0", Wiley India.

Course Outcome:

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

1. Explain the fundamental concepts and principles of Object-Oriented Analysis and Design.
2. Create UML diagrams (e.g., class diagrams, use case diagrams, sequence diagrams) to model software systems.
3. Apply Object-Oriented Design principles to create scalable and maintainable software solutions.
4. Design a system architecture that adheres to object-oriented principles, ensuring robustness and flexibility.

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Elective-I CSE5052 Block Chain Technologies

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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CSE506P Computer Programming (Unix/Linux Lab)

Course Objectives:

1. Introduce students to the basic concepts of operating systems, focusing on Unix/Linux architecture and commands.
2. Develop proficiency in using the Unix/Linux command line for file management, process control, and system navigation.
3. Teach students to write and execute shell scripts to automate tasks and improve productivity.
4. Introduce networking commands and tools for network configuration and troubleshooting in a Unix/Linux environment.

Unit I: Overview of Unix/Linux:

Concepts, Unix/Linux Installation Process, Hardware Requirements for Unix/Linux, Advantages of Unix/Linux, Reasons for Popularity and Success of Linux/Unix Operating System, Features of Linux/Unix Operating System, Kernel, Kernel Functions, The Shell Basic Commands, Shell Programming:-Shell Variables, Branching Control Structures, Loop-Control Structure, Continue and break Statements, Sleep Command, Debugging Script. Use of Linux as web- server, file server, directory server, application server, DNS server, SMTP server, Firewall, Proxy server.

Unit II: File System:

Definition of File System, Defining Geometry, Disk Controller, Solaris File System, Disk Based File Systems, Network-Based File Systems, Virtual File systems, UFS File System, The Boot Block, The Super Block, The Inode, Tuning File System, Repairing File System.

Process Control: - Viewing a Process, Command to display Process, Process Attributes, Process States, Process Fields, PS Commands options, PGREP, PRSTAT, CDE Process Manager, Scheduling Process, Scheduling Priorities, Changing the Priority of a time-sharing process, Killing Process.

Unit III: System Security:

Physical Security, Controlling System Access, Restricted Shells Controlling File Access, File Access Commands, Access Control List(ACLs), Setting ACL Entries, Modifying ACL entries on a file, Deleting ACL entries on a file, Restricting FTP, Securing Super User Access, Restricting Root Access, Monitoring super user Access, TCP Wrappers.

Dynamic Host Configuration Protocol: - Introduction, DHCP Leased Time, DHCP Scopes, DHCP IP Address, Allocation Types, Planning DHCP Deployment, DHCP Configuration files, Automatic Startup of DHCP Server, Configuration of DHCP Clients, Manually Configuring the DHCP.

Unit IV: Case Study:

Installation of Linux, Customization of Linux, Installation of SAMBA, APACHE, TOMCAT, Send

MAIL, Postfix, Implementation of DNS, LDAP services, Firewall, Proxy server.

Reference Books:

1. Sumitab Das,"Unix Concept & Application",TMH
2. Forouzan, "Unix &Shell Programming", Cengage Learning
3. Venkatesh Murthy, "Introduction to Unix &Shell", PearsonEdu
4. Gopalan, Shivaselvan,"Beginners Guide to Unix " PHI Learning
5. Venkateshwavle,"Linux Programming Tools Unveil`ed", BS Publication.
6. Richard Peterson,"Linux Complete Reference",TMH
7. Richard Peterson,"Unix Complete Reference",TMH

Course Outcome:

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

1. Demonstrate proficiency in using essential Unix/Linux commands for file and directory manipulation, process management, and system monitoring.
2. Write, debug, and execute shell scripts to automate routine tasks and manage system operations efficiently.
3. Manage file permissions and ownership effectively, understanding the implications of security and access control.
4. Apply logical reasoning and problem-solving skills to diagnose and resolve issues encountered in a Unix/Linux system.