RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

CSE-Cyber Security/Cyber Security, IV-Semester

CY401-Introduction to Linear Algebra

Unit I. Direct sum of a vector space, Dual Spaces. Annihilator of a subspace, Quotient Spaces. Algebra of Linear transformations.

Unit II. Characteristic values and characteristic polynomials, diagonalizable transformations, annihilating polynomials, Cayley-Hamilton theorem, invariant subspaces and triangular form, simultaneous triangularization and diagonalization, direct sum decompositions, invariant direct sums, primary decomposition theorem.

Unit III: Adjoint of a linear transformation, Inner product spaces, Eigen values and eigenvectors of a linear transformation. Diagonalization. Invariant subspaces.

Unit IV: Canonical forms, Similarity of linear transformations, Reduction to triangular forms, Nilpotent transformations, Primary decomposition theorem, Jordan blocks and Jordan forms, Invariants of linear transformations.

Unit V: Hermitian, Self adjoint, Unitary and normal linear transformation, Symmetric bilinear forms, skew symmetric bilinear forms, Group preserving bilinear forms.

Unit 3. Inner product spaces, adjoints, unitary and normal transformations, spectral Theorem, Jordan canonical form.

Text Books:

1. K. Hoffman and R. Kunze: Linear Algebra, 2nd Edition, Prentice Hall of India, 2005
2. S. Axler: Linear Algebra Done Right, 2nd Edition, Springer UTM, 1997.

Reference Books:

1. P. Halmos, Finite dimensional vectors paces, Springer, 1974.
2. Peter D. Lax, Linear algebra, Wiley student edition, 1997.
3. E.B. Vinberg, A course in algebra, Graduate text in Mathematics, volume 56, AMS, 2003.
4. M. Thamban Nair and Arindama singh, Linear algebra, Springer, 2018.

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CSE-Cyber Security/Cyber Security, IV-Semester

CY402 Fundamental of Cyber Security

Unit 1
Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: E-Mail
Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique,

UNIT 2
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 3
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 4
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 5
Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks ,
Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing
Techniques.

Suggested 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.

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CSE-Cyber Security/Cyber Security, IV-Semester

CY403 - Computer Networks

COURSE OUTCOMES:

After completing the course student should be able to:

- Explain different terminologies of computer network and compare the architecture of networks.
- Evaluate the MAC layer performance.
- Construct and evaluate the existing protocols at the network and transport layer.
- Design and debug the IP networks.

UNIT 1 Introduction to computer networks & their uses, Different topologies, ISO-OSI model: Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services of OSI layers; The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel, Shennons theorem, Nyquist theorem. Transmission media: Guided and Unguided media, Circuit, Packet and Message switching, virtual Circuit. Introduction to ISDN & its components.

UNIT 2 The data link layer: Design issues & function, Error detection & correction, Forward error correction Versus Retransmission, Hamming code & CRC codes, Framing: Fixed size and Variable size Frame, Bit stuffing and Byte stuffing. Data link layer protocols: Simplest, Stop and Wait, Sliding window protocols, PPP, SLIP, HDLC. The medium access sublayer: Static and Dynamic Channel Allocation, Protocols: ALOHA Protocol, CSMA (CSMA/CD, CSMA/CA), Collision Free Protocol- Bit Map.

UNIT 3 IEEE 802 standards for LANs (IEEE 802.3, IEEE 802.4, IEEE 802.5), LAN Devices: HUB, Switches- Learning, Cut-Through and store and forward switches, Bridges: IEEE 802.x to IEEE 802.y, Spanning Tree, Remote Bridge. Internetworking Devices: Routers & gateways. The network layer: Design issues and functions, Internal organization (Virtual Circuit & Datagrams).

UNIT 4 Routing algorithms: Shortest path routing, Flooding, LSR, Distance Vector Routing, Hierarchical Routing. Introduction to TCP/IP Protocol stack: Protocol Architecture, Classful IP addressing, ARP, RARP, IP Datagrams with options and its delivery, ICMP.

UNIT 5 Subnet, Supernet, CIDR. Transport Layer: Congestion control, Load Shedding, Jitter control, addressing and multiplexing, Connection establishment and connection release, flow control. Application layer: Introduction to DNS and Email.

1. ."Computer Networks" - Tanenbaum ,PHI Learning
2. "Data Communication & Networks " , Fourouzan TMH
3. "TCP/IP-Protocol suite", Forouzan, TMH 3rd edition
4. "Computer Networks and Internets", D.E.Comer, Pearson
5. "TCP/IP Illustrated" W. Richard Stevens, Volume I, Addison Wesley,
6. "Internetworking with TCP/IP Vol. I, II & III", Comer , PHI Learning.

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CSE-Cyber Security/Cyber Security, IV-Semester

CY404 Operating Systems

COURSE OUTCOMES:

After completing the course student should be able to:

1. Describe the importance and objectives of an operating system and various services provided by the operating system.
2. Interpret the important functions of different modules of an Operating system, like process management, memory management, device management and file system, etc. and will be able to apply these concepts in given test cases.
3. Compare and contrast different policies of CPU scheduling, Inter-process Communication, Page replacement and disk scheduling algorithms etc.
4. Design and develop small modules, shell and utility programs using system calls of Linux or some educational operating system.

UNIT 1 **Introduction to Operating Systems**: Function, Evolution, Desirable Characteristics and features of an O/S, Operating Systems Services: Types of Services, Different ways of providing these Services – Utility Programs, System Calls.

UNIT 2 **Process Management**: Concept of a process, Process State Diagram, Process based kernel, Dual mode of process execution, CPU scheduling algorithms, deterministic modeling, and System calls for Process Management, Concept of Threads: User level & Kernel level Threads. Process Management in UNIX & Windows

Inter Process Communication: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, Critical Section Problem, Solution to Critical Section Problem : Semaphores and their Operations and their implementation.Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery. IPC in UNIX & Windows

UNIT 3 **Memory Management**: Different Memory Management Techniques – Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Techniques for supporting the execution of large programs: Overlay, Dynamic Linking and Loading, Virtual Memory – Concept, Implementation by Demand Paging etc. Memory management in UNIX & Windows

UNIT 4 **File Systems Management**: File Concept, User's and System Programmer's view of File System, Disk Organization, Tape Organization, Different Modules of a File System, Disk Space Allocation Methods – Contiguous, Linked, Indexed. Directory Structures, File Protection, System Calls for File Management, Disk Scheduling Algorithms. File Systems in UNIX & Windows.

UNIT 5 **Input / Output Management** : Principles and Programming, Input/Output Problems, Different I/O operations: Program Controlled, Interrupt Driven, Concurrent I/O, Asynchronous Operations, Logical structure of I/O function, I/O Buffering,Kernel I/o Subsystem.Introduction to Network, Distributed and Multiprocessor Operating Systems. I/O management in UNIX & Windows

TEXT BOOKS RECOMMENDED:

1. Silberschatz, Galvin, Gagne, "Operating System Concepts'', Wiley, 9/E
2. William Stalling, "Operating Systems", Pearson Education

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 3/e, Prentice Hall
2. Maurice J. Bach, " The Design of Unix Operating System", Prentice Hall of India,
3. Bovet & Cesati, "Understanding the Linux Kernel", O'Reily, 2/E.

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CSE-Cyber Security/Cyber Security, IV-Semester

CY 405 Data base Management System

COURSE OBJECTIVES: The objective of this course is to enable students in developing a high level understanding of the concepts of Database management systems in contrast with traditional data management systems with emphasis on skills to apply these concepts in building, maintaining and retrieving data from these DBMS.

COURSE OUTCOMES:

After completing the course student should be able to:

1. Describe design of a database at various levels and compare and contrast traditional data processing with DBMS.
2. Design a database using Entity Relationship diagram and other design techniques.
3. Apply fundamentals of relational model to model and implement a sample Database Management System for a given domain.
4. Evaluate and optimize queries and apply concepts of transaction management.

UNIT 1 Basic Concepts of Data and DBMS, File organization and access methods; Introduction to DBMS, Difference between DBMS and traditional file storage system. Characteristics of DBMS. Data Models, Schemas and Instances, DBMS architecture, Components of DBMS. Data Independence. Study of Entity Relationship Model, Type of attributes, Entity types, Relationship and Cardinalities, Participation, Roles and constraints.

UNIT 2 Relational Data Model: Domains, Tuples, Attributes, Relations, keys and types of keys, Integrity Constraints, Relational Algebra: Queries using Select operation, project operation, renaming, joins, union, intersection, difference, division, and product etc.

SQL –basic SQL queries, functions, constraints, joins and nested queries, Triggers, assertions, views and stored procedures and PL/SQL.

UNIT 3 Normalization Theory and Database methodologies: Relation Schemas, Functional Dependencies- Definition and rules of axioms, Normal forms- 1NF, 2NF, 3NF and BCNF, Dependency preservation, properties, loss less join decomposition.

UNIT 4 Transaction Processing: States of transaction and desirable properties, Introduction to Concurrency and Recovery, Schedules, Recoverability & Serializability, types of serializability and test for serializability, Concurrency Control: Two phase locking, Timestamp Based concurrency control. Deadlocks: Avoidance, Prevention , detection & resolution, Recovery: Basic concepts, techniques based on deferred update and immediate update, Shadow paging, check points.

UNIT 5 Storage structures: Secondary Storage Devices, Hashing & Indexing structures: Single level & multilevel indices, Query Processing and Optimization: Various algorithms to implement select, project & join operation of relational algebra, complexity measures. Case Study of any contemporary DBMS.

Reference Books:

1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson.
3. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB publications.
4. S. Sharma, J. Agrawal, S. Agrawal, "Advanced Database Management System", Dreamtech Press.
5. Leon & Leon, "Fundamental of Data Base Management System", TMH

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CY 406 Advance Python Programming

UNIT 1. Review of python: Basic of python, Program structure, Data Types, Operators, control flow, function, module and package, classes and objects.

UNIT 2. Socket Programming Client-side programming using python: TCP and UDP based clients and servers. A look at high-level library modules that allow Python to connect to standard Internet and web-related services (e.g., HTTP, FTP, XML-RPC, etc.). urllib2 module: Python to interact with web servers.

UNIT 3. Internet Data Handling:Process common Internet data formats such as HTML, XML, and JSON. Provides detailed coverage of the ElementTree interface for parsing XML.

UNIT 4. Web Programming:Basics of web programming in Python. CGI scripting, the WSGI interface, and implementing custom HTTP servers.

UNIT 5. Advanced Networking: Topics related to more advanced aspects of network programming. Covers modules for writing custom TCP/UDP servers, concurrency, SSL, and an introduction to message passing.

UNIT 6. Thread Programming:Overview of concurrent programming with threads and advanced Python programming idioms, The threading library, Thread debugging ,Thread synchronization, Threads and queues, Python interpreter execution model and the global interpreter lock (GIL) , logging module, Context managers

UNIT 7. Message Passing and Data Serialization:Interprocess communication, message passing, and data serialization. :pickle and ctypes. Multiprocessing: process objects, pipes, queues, shared memory objects, and process pools.

UNIT 8. Distributed Computing:Core programming concepts such as actors, client/server computing, REST, remote procedure call, and distributed objects. Includes coverage of XML-RPC and use of the multiprocessing library to implement distributed objects.

UNIT 9. Advanced I/O handling: An examination of different I/O handling models including blocking I/O, nonblocking I/O, polling, signal-driven I/O, and asynchronous I/O.

Unit -10 Generators and Coroutines: A look at how to use generators and coroutines to implement a form of cooperative multitasking :tasklets, greenlets, coroutines, etc.

Reference Books:

1. **Martin C. Brown, "Python: The Complete Reference", McGraw-Hill publication, 2001**
2. **SakisKasampalisQuan Nguyen Dr Gabriele Lanaro Dr. Gabriele Lanaro, "Advanced Python Programming: Build high performance, concurrent, and multi-threaded apps with Python", Packt publication, 2019**
3. **Micha Gorelick&IanOzsvaid, "High Performance Python", O'Reilly publication ,2020**