Integral University Lucknow
Study & Evaluation Scheme
B. Tech. (Computer Science &Engg.)

Semester –VII

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam.	
				L	T	P	C	CT	TA	Total (CA)	ESE	
1	CS 409	DC	Computer Architecture	3	1	0	4	25	15	40	60	100
2	CS 410	DC	Distributed Systems	3	1	0	4	25	15	40	60	100
3	CS 412	DC	Cryptography and Network Security	3	1	0	4	25	15	40	60	100
4		DE	Departmental Elective-9	3	1	0	4	25	15	40	60	100
5		DE	Departmental Elective-10	3	1	0	4	25	15	40	60	100
6	CS 411	DC	Distributed Systems Lab	0	0	2	1	30	30	60	40	100
7	CS 413	DC	Cryptography and Network Security Lab	0	0	2	1	30	30	60	40	100
8	CS 421	DC	Minor Project	0	0	2	1	30	30	60	40	100
9	CS 300	DC	Industrial Training	-	-	-	0	-	-	-	-	100
			Total	**15**	**5**	**6**	**23**	**245**	**195**	**380**	**420**	**800**

L-Lecture T-Tutorial P-Practical C-Credits CT-Class Test TA-Teacher Assessment

Sessional Total (CA) = Class Test (CT) + Teacher Assessment (TA)

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

DC- Departmental Core HM- Humanities DE- Departmental Elective

ESA- Engineering Sciences & Arts (Foundation Course & Engineering Courses)

Departmental Elective-9

- Concepts in Advanced Database system (CS 414)
- Fuzzy Logic & Neural Networks (CS 415)
- Data Compression (CS 416)

Departmental Elective-10

- Mobile Computing (CS 417)
- Data Warehousing & Data Mining (CS 418)
- Pattern Recognition (CS 419)

COMPUTER ARCHITECTURE
CS-409
w.e.f. Session 2018-19

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UNIT 1
Introduction to Computer Architecture, Evolution of Computer Architecture**,** Parallel Computing, Parallel Architectural Classification Schemes: Flynn's, Shores, Feng's Classification; Performance of Parallel Processors: Speedup Performance Laws, Amdahl Law, and Gustafson Law, Performance Metrics and Measures. [8]

UNIT 2
Pipeline Processing: Introduction to Pipeline Processing, Arithmetic Pipelines, Pipelined Instruction Processing, Instruction Level Parallelism. Interlocks, Hazards, and Hazards Detentions & Resolution, Scheduling of Pipelines. [8]

UNIT 3

Processor Architectures: Superscalar Architecture, Vector Architecture and VLIW Architecture, Superpipeline design, Memory Technology: Cache Architecture; Cache Coherence and Synchronization Mechanisms, Shared-Memory Organizations. [9]

UNIT 4
Parallel and Scalable Architectures: Multiprocessor and Multivector Computers, Vector Processing Principles, SIMD Computer Organizations, SIMD Parallel Processors, Scalable Architectures.
[7]

UNIT 5

Multi-threading, Simultaneous multithreaded (SMT) Architectures; Interconnection Networks for Parallel Computers: Elementary Permutations, Single Stage and Multi Stage Interconnection Network, Cross Bar, Clos Network, Benes Network, Shuffle Exchange and Omega Network.
[8]

REFERENCES

1. Peterson & Heresy, "Quantitative approach to computer Architecture",
2. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International.
3. "Morgan Kaufman". Quin, "Parallel computing, Theory & Practices", McGraw Hill
4. Bhujde, "Parallel Computing", New Age International Hwang, "Advance Computer Architecture",

CRYPTOGRAPHY AND NETWORK SECURITY

CS-412

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UNIT 1

Introduction to OSI Security Architecture: Security Attacks, Services and Mechanisms, Introduction to Cryptology. Conventional Encryption: Conventional Encryption Model, Classical Encryption Techniques – Substitution Ciphers: Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One-Time Pad; Transpositions Ciphers: Rail Fence Technique; Rotor Machines, Cryptanalysis, Staganography;

Modern Block Ciphers- Block Ciphers Principles: Stream & Block Ciphers, Fiestal Cipher, Shannon's Theory of Confusion and Diffusion, S-DES, Data Encryption Standards (DES): DES Encryption and Decryption, Strength of DES.

UNIT 2

Block Cipher Modes of Operation: ECB, CBC, CFB, OFB, CTR, Triple DES: Double DES, TDES with Two Keys, TDES with Three Keys.

Symmetric Key Distribution using KDC, Random Number Generation: Use of Random Numbers, Pseudo Random Number Generators, Cryptographically Generated Random Numbers, Blum Blum Shub Generator.

Introduction to Graph, Ring and Field, Prime and Relative Prime Numbers, Modular Arithmetic, Fermat's & Euler's Theorem, Primality Testing, Euclid's Algorithm.

UNIT 3

Principles of Public Key Cryptosystems: Introduction, Application & Requirement; RSA Algorithm: Computational Aspects, Security of RSA; Diffie-Heilman Key Exchange Algorithm, Introductory Idea of Elliptic Curve Cryptography.

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes(MAC) , Hash Functions: Requirement for a Hash Function, Simple Hash Functions, Security of Hash Function & MAC, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-1).

UNIT 4

Digital Signatures: Requirements, Direct & Arbitrated Digital Signature, Protocols: Mutual & One way Authentication; Digital Signature Standard (DSS): DSS Approach, Digital Signature Algorithm. Authentication Applications: Kerberos Version 4 & Difference between Kerberos v4 & v5, Kerberos Realms; X.509 Authentication Service: Authentication Procedures, Directory Authentication Service; Electronic Mail Security – Pretty Good Privacy (PGP): Operational Description, Cryptographic Keys, Key Rings, Public Key Management.

UNIT 5

IP Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management; Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (SET);

System Security: Intruders, Viruses and Related Threats: Malicious Programs, The Nature of Viruses, Types of Viruses, Macro Viruses, Email Viruses; Firewall: Firewall Design Principles, Trusted Systems.

REFERENCES:

1. William Stallings, “Cryptography and Network Security: Principles and Practice” Prentice Hall, New Jersey.

2. Johannes. A. Buchmann, “Introduction to cryptography”, Springer Verlag. Bruce Schiener, “Applied Cryptography”.

Concepts in Advanced Database system

CS-414

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UNIT 1

Clustering & Indexing, Query Processing, Estimations for Query Processing Cost Algorithms for executing selection Operations, Algorithms for executing Join Operations, Algorithm for executing Project Operations. Query Optimization: Heuristics for Query Optimizations, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS.

UNIT 2

Database Tuning: Database Workloads, Tuning Decisions, DBMS Benchmarks, Multiple Attribute Search Keys, Extended Relational Model & Object Oriented Database System: Requirement, Properties, Structured Types ,Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Nested Relational model.

UNIT 3

Distributed Database System: Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Concurrency Control in Distributed Database System, Recovery in Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols.

UNIT 4

Database Security: Database Security, Access Control and Grant & Revoke on Views and

Integrity Constraints, Mandatory & Discretionary Access Control, Role of DBA, Security in Statistical Databases.

UNIT 5

Enhanced Data Model for Advanced Applications: Database Operating System, Introduction to Temporal Database Concepts, Introduction to Spatial and Multimedia Databases, Introduction to Data Mining, Introduction to Active Database System & Deductive Databases, Database Machines, Web Databases,

REFERENCES

1. Majumdar & Bhattacharya, “Database Management System”, TMH.
2. Korth, Silberchatz, Sudarshan, “Database Concepts”, Addison Wesley.
3. Elmastri, Navathe, “Fundamentals of Database Systems”, Addison Wesley.
4. Date C.J., “An Introduction to Database System”, Addison Wesley.
5. Ramakrishnan, Hadzilacous, Goodman, “Concurrency Control & Recovery”, Addiosn Wesley.
6. Ceri & Palgatti, “Distributed Databases”, McGraw Hill.

FUZZY LOGIC AND NEURAL NETWORKS

CS 415

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UNIT 1 [8]

Introduction, History of Neural Networks, Structure and Function of a Single Neuron, Architectures and Their Applications, Supervised Learning: Single Layer Networks: Perceptrons, Linear Seperability, Perceptron Training Algorithms and Their Modifications: Pocket Algorithm and Adaline. **Supervised Learning:** Multiplayer Networks: Multilevel Discrimination, Preliminaries, and Backpropagation Algorithm, Setting the Parameters Values, Accelerating the Learning Process.

UNIT 2 [8]

Adaptive Multilayers Networks: Network Pruning Algorithms, Marchands Algorithm, Upstart Algorithm, Cascade Correlation. Prediction Networks: Feed Forward Networks for Forecasting, Recurrent Networks (Partially, Fully), Radial Basis Functions and Probabilistic Neural Networks.

UNIT 3 [8]

Unsupervised Learning: Winner-Take-All Networks: Hamming Networks, Maxnet; Learning Vector Quantization, Counter Propagation Networks(Forward Only Counter Propagation networks) , Adaptive Resonance Theory(ART1), K-Means Clustering Algorithms, Kohonens Self Organization Maps, Principle Component Analysis.

UNIT 4 [8]

Fuzzy Logic: Fuzzy Sets, Properties, Operation on Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy Relations, Fuzzy IF-THEN Rules, Variable Inference Techniques, Fuzzification and Defuzzification Methods, Fuzzy System Design.

UNIT 5 [8]

Associative Models: Auto-Association, Hetro-Association, Hopefield Networks, Brain State-In-ABox Networks, and Boltzman Machines. **Optimization Methods:** Optimization Using Hopefield Networks, Introduction to Simulated Annealing and Ant Colony Optimization and Evolutionary Computation, Introduction to Hybrid Systems, Introduction to Deep Learning.

REFERENCES:

1. Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka, Elements of Artificial Neural Networks, MIT Press/Penram International.

2. Simon Haykin, Neural Network a comprehensive Foundation, Macmillan College, proc, Con, Inc.

3. Ross T.J., Fuzzy Logic with Engineering Applications, McGraw-Hill.

4. Zurada J.M., Introduction to Artificial Neural Systems, Jaico Publishers.

5. Riza C. Berkiu and Trubatch, Fuzzy system Design Principles, Building Fuzzy IF-THEN Rule Bases, IEEE Press.

6. Goldberg D.E., Genetic Algorithms in Search Optimization and Machine Learning, Addison Wesley.

7. Dorigo and Thomas Stützle, Ant Colony Optimization, MIT Press.

8. Intelligent Hybrid Systems, Suran Goonatilake and Sukhdev Khebbal (Eds.), Intelligent Hybrid Systems, John Wiley.

DATA COMPRESSION

CS-416

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UNIT 1 **[7]**

Introduction: Compression Techniques: Loss Less Compression, Lossy Compression, Measures of Performance, Modeling and Coding. Mathematical Preliminaries for Lossless Compression: A Brief Introduction to Information Theory:- Models: Physical Models, Probability Models, Markov Models, Composite Source Model, Coding:-Uniquely Decodable Codes, Prefix Codes.

UNIT 2 **[7]**

Huffman Coding: The Huffman Coding Algorithm: Minimum Variance Huffman

Codes, Adaptive Huffman Coding. Golomb Codes, Rice Codes, Tunstall codes. Application of Huffman Coding. Text compression, Audio Compression.

UNIT 3 **[9]**

Arithmetic Coding: Coding a Sequence, Generating a Binary Code, Comparison of

Binary and Huffman Coding, Applications:- Bi-Level Image Compression. The JBIG,

JBIG2 Standards, Image Compression. Dictionary Techniques: Introduction, Static

Dictionary :- Diagram Coding, Adaptive Dictionary: The LZ77 Approach, The LZ78

Approach Applications.

UNIT 4 **[9]**

Prediction with Partial Match (ppm) : The Basic Algorithm, The ESCAPE SYMBOL, Length of Context, The Exclusion Principle, The Burrows-Wheeler Transform, Move-to- Front Coding, CALIC, JPEG-LS, Dynamic Markov Compression.

UNIT 5

Scalar Quantization **[8]**

Vector Quantization: Advantages of Vector Quantization Over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree Structured Vector Quantizers, Structured Vector Quantizers.

REFERENCES:

1. Introduction to Data Compression, Khalid Sayood, Morgan Kaufmann Publishers.

2. Data Compression: The Complete Reference, Third Edition by David Salomon, Springer, New York, 2004.

MOBILE COMPUTING

CS 417

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UNIT 1

Introduction to Wireless Communication: Application, Frequencies for radio transmission, Signals, Antennas, Signal propagation, Multiplexing: Space division multiplexing, Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Modulation: Amplitude shift keying, Frequency shift keying, Phase shift keying, Advanced frequency shift keying, Advanced phase shift keying, Spread spectrum: Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems.

UNIT 2

Channel Allocation: Motivation for a specialized MAC, Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Carrier sense multiple access with collision detection, Multiple access with collision avoidance.

UNIT 3

Telecommunications systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security; Satellite systems: History, Applications, Basics of GEO, LEO and MEO, Routing, Localization, Handover, Examples; GPRS.

UNIT 4

Wireless LAN: Infra red vs radio transmission, Infrastructure and ad-hoc network, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, 802.11b, 802.11a, Bluetooth: User scenarios, Architecture, Radio layer, Baseband layer. Introduction to WAP architecture and Protocol stack.

UNIT 5

Mobile network layer: Mobile IP: Goals, assumptions and requirements, Entities and

terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, Dynamic host configuration protocol.

Reference ::

1. Jochen Schiller, " Mobile Communications, Pearson Education, 2nd Edition, 2003.
2. Dharma Prakash Agrawal & Qing-An Zeng " Introduction to Wireless & MobileSystems", Thomson Brooks/Cole, 2nd Edition 2003.
3. Krzysztof Wesolowski, "Mobile Communication Systems ", John Wiley & Sons, Ltd.
4. Ron Olexa, "Implementing 802.11, 802.16 and 802.20 Wireless Networks, Elsevier

DATA WAREHOUSE AND DATA MINING

CS 418

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UNIT 1 [8]

Overview & Concepts- The Compelling Need for Data Warehousing: Introduction to Data Warehousing, Failures of Past Decision Support System, Data Warehouse Building Blocks: -Nature of data in data warehouse, OLAP in the Data Warehouse: Major Features and Functions, OLAP Models, Comparison between operational Data Base Systems & Data warehouse.

UNIT 2 [8]

Data Warehouses and Data Marts, Overview of Components, Meta data & its types, Multidimensional Data Model: - Data cubes, Schemas for multidimensional databases, concept hierarchies, OLAP operations in multidimensional data models, Data Warehouse Architecture: - 3-tier architecture, Data Extraction, Transformation, and Loading, Data Quality: Why is data Quality Critical? Data Quality Challenges.

UNIT 3 [8]

Data Mining: Introduction, Data Mining Functionalities, Classification of Data Mining System; Major Issues in Data Mining, Data Preprocessing: Preprocess, Descriptive Data Summarization, Data Cleaning, Data Integration & Transformation, Data Reduction, Mining Frequent Patterns, Association, and Correlations, Basic Concept, Efficient & Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules.

UNIT 4 [8]

Classification & Prediction: Issues, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back Propagation, Associative Classification, nearest neighbor classification, Prediction.

UNIT 5 [8]

Cluster Analysis: What is Cluster Analysis, Types, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods- cure and chameleon, Density-Based Methods: DBSCAN & OPTICS, Wave Cluster, CLIQUE. Current trends: Text mining, web mining.

REFERENCES

1. “Data Warehousing Fundamental” by Paulraj Ponniah,John Wiley & Sons INC.

2. Data Mining Concepts & Techniques by Jiawei Han & Michline Kamber.

3. Mallach,”Data Warehousing System”,McGraw Hill

4. M.H.Dunham, “Data Mining:Introductory and Advanced Topics” Pearson Education

DISTRIBUTED SYSTEMS

CS-410

w.e.f. Session 2018-19

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UNIT 1

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction: Examples of Distributed Systems, Resource Sharing and the Web Challenges. System Models Architectural Models, Fundamental Models, Theoretical Foundation for Distributed System: Limitation of Distributed System, Absence of Global Clock, Shared Memory, Logical Clocks, Lamports & Vectors Logical Clocks, Causal Ordering of Messages, Global State, Termination Detection. Distributed Mutual Exclusion: Classification of Distributed Mutual Exclusion, Requirement of Mutual Exclusion Theorem, Token Based and Non Token Based Algorithms, Performance Metric for Distributed Mutual Exclusion Algorithms.

UNIT 2

DISTRIBUTED DEADLOCK DETECTION: System Model, Resource vs Communication Deadlocks, Deadlock Prevention, Avoidance, Detection & Resolution, Centralized Dead Lock Detection, Distributed Dead Lock Detection, Path Pushing Algorithms, Edge Chasing Algorithms. Agreement Protocols: Introduction, System Models, Classification of Agreement Problem, Byzantine Agreement Problem, Consensus Problem, Interactive Consistency Problem, Solution to Byzantine Agreement Problem, Application of Agreement Problem, Atomic Commit in Distributed Database System.

UNIT 3

DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Communication Between Distributed Objects, Remote Procedure Call, Events and Notifications, Security:- Overview of Security Techniques, Cryptographic Algorithms, Cryptography Pragmatics, Needham Schroeder, Kerberos, SSL & Millicent, Replication: System Model and Group Communication, Fault – Tolerant Services, Highly Available Services, Transactions with Replicated Data.

UNIT 4

TRANSACTIONS AND CONCURRENCY CONTROL: Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control. Distributed Transactions: Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Distributed File Systems: File Service Architecture, Sun Network File System, The Andrew File System, Recent Advances.

UNIT 5

Distributed Shared Memory (DSM): Architecture, Algorithms for implementing DSM, Client- Server Algorithm, Migration Algorithm, Read Replication Algorithm, Full Replication Algorithm.

Distributed Multimedia Systems: Introduction, Characteristics of Multimedia data, Quality of service management, Resource management, Stream Adaption.

Case Study: CORBA RMI, CORBA Services, Java RMI.

REFERENCES:

1. Couloris, Dollimore, Kindberg," Distributed systems: Concepts and Design". PearsonEducation Asia, 3ed.
2. Singhal and Shivratri," Advanced Concepts in Operating Systems", Mc Graw Hill.

Cryptography and Network Security Lab

CS 413

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Part-1: Experiments based on C, C++or JAVA

Experiment List

Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:

1. Caesar Cipher
2. Playfair Cipher
3. Hill Cipher
4. Vigenere Cipher
5. Rail fence – row & Column Transformation

Implement the following Symmetric, asymmetric and signature algorithms

6. RC-4
7. S- DES
8. RSA Algorithm
9. Diffiee-Hellman
10. Implement the Signature Scheme - Digital SignaturStandard

Part-2: Experiments based on Network Security Tools

Experim

ent List

11. Setup a honey pot and monitor the honeypot on network (KF Sensor)
12. Steps to ensure Security of any one web browser Mozilla Firefox /Google Chrome).3.0 Learning
13. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)
14. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)
15. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)