



SLIET LONGOWAL

2.2.2 - COMPUTER SCIENCE AND ENGINEERING (Ph.D. - CSE)

Course work Subject codes and subject names

SUB CODE	SUBJECT NAME
CS-10001	Computer Networks
CS-10002	Network Programming
CS-10003	WIRELESS SENSOR NETWORKS
CS-10004	OPTIMIZATION TECHNIQUES
CS-10005	DIGITAL IMAGE PROCESSING
CS-10006	Data Communication and Network Security
CS-10007	Cloud Computing
CS-10008	Soft Computing
CS-10009	Pattern Recognition



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CS-10001 COMPUTER NETWORKS

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UNIT-I

Basics of Networking, Description of LAN, MAN, WAN and wireless Networks, OSI and TCP/IP models with description of Data Encapsulation & Peer to Peer communication, Mobile Adhoc networks, Data transmission in wired network, and wireless Network.

UNIT-II

LLC and MAC sub layer, MAC addressing, Framing Error control and flow control, Error Detection & Correction , Elementary data link protocols, Channel allocation problem – static and dynamic. Multiple Access protocol – ALOHA, CSMA/CD, CSMA/CA, Token bus, Token ring.

UNIT-III

Network layer addressing, Network-layer data gram, IP addressed classes. Subnetting – Sub network, Subnet mask. Routing algorithm – optimality Principle, Shortest path routing, Hierarchical routing, Broadcast routing, Multicast routing, Routing for mobile host – Concatenated Virtual circuits, tunneling, Fragmentation and DHCP. Routing Protocol – RIP, IGRP, OSPF and EIGRP.

UNIT-IV

Transport Layer Protocols: TCP & UDP. Three-way hand shakes open connection. Application layer design issues., Application layer protocols: TELNET, FTP, HTTP, SNMP.

Need of network security. Security policies, network security at various layers, Introduction to DoS and DDoS.

Books

Computer Networks	Tanenbaum	PHI
Computer Networks and Their Protocols	Darix	DLA Labs
Comp. Communication & Networks	Freer	East-West-Press
Data Communication	Forouzen and Networking	Tata McGraw Hill



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CS-10002 NETWORK PROGRAMMING

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UNIT-I

Socket Programming: Creating sockets, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, socket implementation (client & server programs).

UNIT-II

APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

UNIT-III

Web Programming & Security: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

UNIT-IV

Client/Server Programming: Client side programming: Creating sockets, Implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, adding multithreading to an HTTP server.

Books

1. Steven.W.R, UNIX Network Programming, PHI (VOL I& II)
2. Bobb Quinn and Dave Schutes, Window Socket Programming
3. Davis.R.: Windows Network Programming, Addison Wesley
4. Baner .P., PH New Jersey, NETWORK PROGRAMMING With Windows Socket
5. Ivan Stojmenovic (Editor), Handbook of Wireless Networks and Mobile Computing, Wiley, ISBN: 0-471-41902-8, February 2002
6. Core Java Volume I and II from Sun Micro Systems.
7. Huges, Java Networking, Hut Publication, Pune
8. Java2: The Complete Reference 4/e; Herbert Schildt, TMH, Delhi.



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CS-10003 WIRELESS SENSOR NETWORKS

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UNIT-I

Adhoc Wireless:

Mobile Adhoc Networks, Technologies for Adhoc Network, Issues in Adhoc wireless Networks, IEEE 802.11 Architecture and protocols. Protocol for ADHOC Wireless Networks

Issues and classification of MAC protocol, other MAC protocols, Dynamic Source Routing (DSR), On-demand Distance Vector (AODV) Routing Protocols, and Multicasting Routing issues.

UNIT-II

Transport Layer & Security Protocols:

Issues in designing transport layer protocols, TCP over Adhoc Wireless Networks, Network Security Attacks, and Key management..

UNIT-III

Wireless Sensor Networks

Basic Sensor Network Architectural Elements, Applications of Sensor Networks, Comparison with Wireless Networks, Challenges and Hurdles. Architecture of Wireless Sensor Networks (WSNs) Hardware components, Operating systems and execution environments, some examples of sensor nodes, Network Architecture, Sensor networks scenarios, Optimization goals and figures of merit, Design principles for WSNs.

UNIT-IV

Communication Protocols

Physical Layer and Transceiver design considerations in WSNs, Fundamentals of (wireless) MAC protocol, Address and name management in wireless sensor networks, Localization and positioning.

Routing protocols Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless, Routing Strategies in WSNs, Quality of Service (QoS) in wireless sensor networks, Coverage and deployment.

Books:

1. Adhoc Wireless Networks: Architectures & Protocols, C Siva Ram Murty & BS Manoj, 2nd Ed, Pearson Education.
2. Fundamentals of Mobile and Pervasive Computing, Adleshein & Gupta, TMH, 2005.
3. Wireless Sensor Networks Technology, Protocols, and applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons, John Wiley & Sons.



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CS-10004 OPTIMIZATION TECHNIQUES

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UNIT-I

Optimization Problem: Definition, types, optimality criteria, single-variable optimization, exhaustive search, region elimination, fibonacci search and golden section search, cubic interpolation method, Newton-Raphson bisection and secant method.

UNIT-II

Multivariable Optimization Algorithms: Direct search methods-evolutionary simplex, Hooke-Jeeves pattern search, Gradient Based Method- Steepest method, Newton conjugate gradient method.

UNIT-III

Constrained Optimization: Kuhn Tucker condition, transformation methods, penalty function, method of multipliers, sensitivity analysis, interior point optimization.

UNIT-IV

Non-Traditional Optimization: Genetic Algorithms for constrained optimization, simulated annealing, Multi Objectives Optimization Problems, weighting method, ϵ - constrained method, decision-making, min-max problem. Evolutionary Programming, Particle Swarm Optimization.

Books:

1. Optimization Techniques, S S Rao.
2. Optimization for Engineering Design Algorithms and Examples, Kalyanmoy Deb, PHI.
3. Emerging Optimization Techniques in Production Planning & Control by Godfrey G Onubolu, Imperial College Press.
4. Multi Objective Optimization using Evolutionary Algorithms by Kalyanmoy Deb, Chichester, UK, Wiley.
5. Non-Linear programming; Sequential Unconstrained Minimization Techniques by A V Fiacco and G P McCormick, John Wiley & Sons, New York.
6. Modern Optimization Techniques in Power Systems by Yong Hua Song, Kluwer Academic Publishers.
7. Power System Optimization by D.P.Kothari, J.S. Dhillon, PHI



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CS-10005 DIGITAL IMAGE PROCESSING

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UNIT-I

Digital Image Fundamentals

Scenes and images, different stages of image processing and analysis, components of image processing system, visual preliminaries, brightness adaptation and contrast, acuity and contour, texture and pattern discrimination, shape detection and recognition, colour perception, image formation, geometric and photometric models, digitization including sampling, quantization and digital image visual details.

UNIT-II

Image Enhancement and Restoration

Contrast intensification comprising of linear stretching, non-linear stretching, fuzzy property modification, histogram specification, modifying grey level co-occurrence matrix and local contrast stretching, smoothing including image' averaging, mean filter, ordered statistic filter, edge-preserving smoothing and low pass filtering, image sharpening including high- pass filtering and homomorphic filtering, image restoration fundamentals, minimum mean square error restoration least square error restoration, constrained least square error restoration..

UNIT-III

Image Compression

Fundamentals of image compression, error criterion, lossy compression including transform compression, block truncation compression, vector quantization compression, lossless compression including Huffman coding method.

UNIT-IV

Image Segmentation and Edge Detection

Region extraction, pixel based approach including feature thresholding, optimum thresholding and threshold selection, methods, edge detection fundamentals, derivative operators including Roberts, 4-neighbour, Prewitt and Sobel operators, Canny edge detector, Laplacian edge detector and Laplacian of Gaussian edge detector.

Books

Digital Image Processing	Rafael C. Gonzalez	Pearson
Digital Image Processing & Analysis	Chanda & Majmudar	nPHI
Computer Viosion and Image Processing	New Age International	S Nagabhushana



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CS-10006 DATA COMMUNICATION AND NETWORK SECURITY

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UNIT-I

Introduction: Data communication and network security, Data representation, Components, Protocols and standards, Network Models, OSI model, TCP/IP model, Data and signals, Transmission performance parameters, Multiplexing, FDM, TDM, WDM, Transmission media, guided and unguided, Circuit switching, Packet switching, Message switching, Error and correction, Hamming code.

UNIT-II

Network Security : Issues- Impersonation, Security Services, Message Confidentiality, Message integrity, Message authentication, Message non-Repudiation, Digital Signature, IP Security, SSI/TLS, Virtual Private Networks and Firewalls.

Web Security: Web Servers Secure Electronic Mail, Enhance Email, Pretty Good Privacy.

UNIT-III

Cryptography : Security goals, Attacks, Type of Cryptography, Linear congruence, Chinese Remainder Theorem, Symmetric Key Cryptography, Monoalphabetic Substitution Ciphers such as the Caesar Cipher, Cryptanalysis of Monoalphabetic Ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher, Transposition Ciphers, Stream and block ciphers, Modern Ciphers, One time pad Ciphers, two dimensional ciphers, Asymmetric Key Cryptography, Encryption system, Merkle-Hellman and Knapsacs, Rivest-Shamir-Adleman(RSA) Encryption, DES Standard.

UNIT-IV

Steganography and Watermarking : Type of Steganography, Attacks on Steganography, Characteristics of Steganography, LSB Substitution Techniques, Moderate Bit Substitution method, Modern Application of Steganography, Introduction of Watermarking.

Books

Data communication and networking	Bebrouz A Forouzan	TMH
Cryptography and Network Security	Bebrouz A Forouzan	TMH
Principles of cryptography	William Stallings	PEARSON EDUCATION
Cryptography and Network Security	Atul Kahate	TMH



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CS-10007 CLOUD COMPUTING

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UNIT-I

Fudmentals of Cloud Computing: Cloud Computing basics, concepts & models, cloud enabling technologies, cloud security

UNIT-II

Cloud Computing Mechanisms: Infrastrutere mechanisms, specialized cloud mechanisms, cloud management mechanism, cloud security mechanisms

UNIT-III

Cloud Computing Architectures: Fundamentals of cloud architecture, advanced cloud architectures, specialized cloud architectures.

UNIT-IV

Cloud in Practice: A study of various cloud delivery model considerations, cloud metrics & pricing models, service quality & SLAs, working with CloudSim.

Books:

1. Cloud Computing concepts, technology and architecture by Mahmood & Puttini : PHI
2. Cloud Computing Bible by Barrie Sosinsky, Wiley India
3. Cloud Application and Architecture by G Reese : SPD,O'REILLY
4. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill.
5. Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more by Dr. Kris Jamsa.
6. Cloud Networking, 1st Edition Understanding Cloud-based Data Center Networks by G Lee : Elsevier.



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CS-10008 SOFT COMPUTING

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UNIT-I

Fundamental Concepts: Artificial Neural Network's basic concepts, Single layer perception, Multilayer Perception, Supervised and Unsupervised learning, Back propagation networks, Kohonen's self organizing networks, Hopfield network. Fuzzy Systems, Fuzzy sets and Fuzzy reasoning, Fuzzy matrices, Fuzzy functions, Decomposition, Fuzzy automata and languages, Fuzzy control methods, Fuzzy decision making.

UNIT-II

Conventional AI: AI search algorithm, Predicate calculus, Rules of inference, Semantic networks, Frames, Objects, Hybrid models, Applications.

UNIT-III

Neuro - Fuzzy Modeling: Adaptive networks based Fuzzy interface systems, Classification and Regression Trees, Data clustering algorithms, Rule based structure identification, Neuro- Fuzzy controls, Simulated annealing, Evolutionary computation.

UNIT-IV

Genetic Algorithms: Survival of the Fittest, Fitness Computations, Cross over, Mutation, Reproduction, Rank method, Rank space method.

Books:

1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall 1998.
2. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
3. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
4. N. J. Nilsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.



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CS-10009 PATTERN RECOGNITION

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UNIT-I

Fundamental Concepts: Introduction to Pattern Recognition systems, Design cycle, Learning and Adaptation. Basic structure of Pattern Recognition System, Sensing, Segmentation & Grouping, Feature extraction, Classification, Post-processing, Bayesian decision theory.

UNIT-II

Maximum-Likelihood and Bayesian Parameter Estimation: Maximum-Likelihood Estimation, Bayesian Estimation, Component Analysis (PCA) & Discriminants, Hidden Markov Model (HMM).

UNIT-III

Nonparametric Techniques & Stochastic Methods: Introduction, Parzen Windows,, Nearest Neighbor classifier, Fuzzy classification, Stochastic search, Boltzmann Learning, Genetic Programming.

UNIT-IV

Multilayer Neural Networks & Application: Feed-forward Operations and Classifications, Back propagation algorithms, Network and Training Methods, Unsupervised Learning & Clustering, Applications of Pattern recognition.

Books:

1. Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, 2nd Addition, 2007. Wiley India Pvt. Ltd.
2. Theodoridis, S. and K. Koutroumbas, Pattern recognition. 4th ed. 2009, San Diego, CA: Academic Press.
3. Peyton Z. Peebles, JR., Probability, Random Variables, & Random Signal Principles, McGraw-Hill, 3rd edition, 1993
4. A.Papoulis, Probability, Random Variables, & Stochastic Processes, McGraw-Hill, 1991