COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

M.TECH. COMPUTER NETWORKING

Course of Study & Scheme of Examination
2016-17

Maulana Azad National Institute of Technology, Bhopal

SCHEME
M.Tech (Computer Networking)
First Semester

Course number	Subject	Schemes of Studies Periods per week			Credits
		L	T	P	
CN 511	Stochastic process and Queuing Theory	3	-	-	3
CN 512	TCP/IP	3	-	-	3
CN 513	Wireless Network	3	-	-	3
	Elective-1	3	-	-	3
	Elective-2	3	-	-	3
	Open Elective - 1	3	-	-	3
CN 514	Laboratory – I (Implementation of Network protocols)	-	-	2	1
CN515	Laboratory II (Based on Elective)			2	1
CN 516	Seminar-I	-		4	2
				Total credit 22	

Second Semester:

Course number	Subject	Schemes of Studies Periods per week			Credits
		L	T	P	
CN 521	Network Devices	3	-	-	3
CN 522	Network Analysis and design	3	-	-	3
CN 523	Graph theory and algorithm	3	-	-	3
	Elective-3	3	-	-	3
	Elective-4	3	-	-	3
	Open Elective - 2	3	-	-	3
CN 524	Laboratory – III (Implementation and designing of Graph Algorithm)	-	-	2	1
CN 525	Laboratory IV (Based on Elective)			2	1
CN 526	Seminar-II	-	-	4-	2
				Total credit 22	

Departmental Elective

Course Number Elective – 1/2 Sem – I	Elective 1 & 2	Course Number Elective – 3/4 Sem – II	Elective 3 & 4
CN 531	Data Mining and Warehousing	CN 541	Secure Software Engineering
CN 532	Operating System and Design	CN 542	Simulation and Modelling
CN 533	Advance Data Structure	CN 543	Cryptography
CN 534	Architecture of Large System	CN 544	Web Search & Information Retrieval
CN 535	Computer and Network Security	CN 545	Secure Cloud Computing
CN 536	Cyber Crime and Information Warfare	CN 546	Embedded System
CN 537	Advance Computer Network	CN 547	Adhoc and Sensor Networks
CN 538	Natural Language Processing	CN 548	Data Communication
CN 539	Optical Networks	CN 549	Computational Intelligence
CN 540	Digital Steganography and Water Marking	HUM XXX	Professional Communication

Open Elective

Course number Open Elective-1 Sem-I	Open Elective 1	Course number OpenElective-2 Sem-II	Open Elective 2
CN 551	Biometric	CN 561	Cloud computing
CN 552	Optimization Technique	CN 562	Digital Image Processing
CN 553	Distributed Computing	CN 563	CAD of Digital System
CN 554	Information theory and coding	CN 564	Object oriented design and modelling
CN 555	Cluster and grid computing	CN 565	Technical foundation of E commerce

Third Semester

Course Number	Subject	Scheme of Studies Period per week			Credits
			T	P	
As Applied by Department(600 series) CN-611	Project Phase -I	-	-	23	23

Fourth Semester

Course Number	Subject	Scheme of Studies Period per week			Credits
		L	T	P	
As Applied by Department(600 series) CN621	Project Phase –II / Dissertation	-	-	23	23

SYLLABUS

CN511 STOCHASTIC PROCESS AND QUEUING THEORY:

The objective of this course is to provide the students basic knowledge about probability and stochastic process with applications. The course will include permutation and combinations, probability theory, Random variable, probability mass function, Binomial, poisson, exponential, normal, uniform distributions, stochastic process and Markov chains.

Introduction of basic Queuing Theory, Markov Chains and Markov Processes, Birth-Death Processes, Simple Queuing Models (M/M/-/- Queues), Queues with Batch Arrivals, M/G/1 Queue with Residual Life and Imbedded Markov Chain Approach, Queues with Vacations, Bulk Arrivals and Priorities, Discrete Time Queues, Delay Analysis of Queues. Fundamental of Queuing Networks, Open and Closed Queuing Networks, Open Networks of M/M/m type queues. Approximate Models for Open and Closed Queuing Networks, Queuing System Applications, Simulation Modelling of Queuing Systems.

References:
1. Donald Gross, James M. Thompson, John F. Shortle and Carl W. Harris, Fundamentals of Queuing Theory, Wiley 2008.
2. Sanjay K. Bose, An Introduction to Queuing Systems, Springer 2002.
3. T.G. Robertazzi, Computer Networks and Systems - Queuing Theory and Performance Evaluation, Springer 2000.
4. L. Kleinrock, Queuing Systems Volume 1: Theory, Wiley 1975.

CN 512 TCP/IP:

IP: Internet Protocol-IP Address Space, IP header, IP Routing, Routing Principal, Routing tables, IP Fragmentation, Checksum, IP options. Subnetting, Subnet masks, Supernetting, CIDR Directly/indirectly connected machines, special IP addresses. Ethernet, framing, ARP, ARP Cache, ARP Packet Format, RARP, Serial Links, CRC , Bridges, Spanning Tree algorithm, ICMP- ICMP message type , ICMP address mask request and reply,ICMP time stamp request and reply, ICMP port unreachable error , ICMP source quench error message ,Ping program and Trace route. UDP, UDP Header, UDP Checksum, determining the path MTU. Interaction between UDP and ARP , maximum UDP datagram size. TCP – TCP Services , Header, Flags, Connection Establishment and Termination, Timeout of Connection Establishment, Maximum Segment Size, TCP State Transition diagram , Segmentation . TCP acknowledgements, server/client transactions, ISN and sequence numbers. TCP data transfer – sliding window,server/client transactions, ISN and sequence numbers. TCP data transfer -- sliding windows, slow start, congestion avoidance, fast retransmit, fast recovery. TCP –

Timeout and Retransmission, RTT measurements, RTO. DNS, DNS Basics, DNS Message Format .multicast and IGMP, FTP- Introduction, FTP Protocols, FTP Examples. SMTP- Introduction, SMTP Protocol, SMTP Examples. PPP, PPP options, HTTP

References
1. TCP/IP Ilustrated vol - I: The Protocols W Richard Stevens
2. TCP/IP Ilustrated vol – III : TCP for Transaction, HTTP, NNTP, and the UNIX Domain Protocols. W Richard Stevens

CN 513 WIRELESS NETWORKING:

Introduction to wireless communication, and future trends, Wireless Generations and Standards, Wireless Physical Layer Concepts, fundamentals of antennas, Cellular Concept and Cellular System Fundamentals. Spread Spectrum Modulation Techniques, Coding and Error Control, Multiple Access Technique for Wireless Communications, OFDM. Wireless LAN Technologies, Wireless IEEE Standards, Mobile Network Layer (Mobile IP). Mobile Transport Layer (Mobile TCP), Mobile Data network (GPRS), WAP Model and architecture, Introduction to Ad hoc networks, Sensor networks, Bluetooth networks and Wireless Mesh networks.

References:
1. Wireless Communications and Networking William Stallings
2. Wireless communication: Principles and Practice, T. S. Rappaport,
3. Mobile Communications Schiller
4. Principles of Wireless Networks: A Unified Approach Pahalvan, K. and Krishnamurthy

CN 521 NETWORKING DEVICES:

LOCAL AREA NETWORKING: Transmission media and Cabling Setting, IP4 : Automatic Private IP Addressing (APIPA), IP4 : Static IP Addressing, Workgroup model network and file sharing, Installation Of Client Operating System, Installation Of Server Operating System, Installation of Active Directory and Users Creation, Mail Server Role, Application Server(IIS) and DNS, File Transfer Protocol (FTP) Server Role, Remote & VPN Server Role, Terminal Server, Dynamic Host Configuration Protocol(DHCP) Server role, Group Policy.
WIDE AREA NETWORKING: IPv4 Subnetting, VLASM Topology, IPv6 Address, Introduction to Routers, Basic configuration of Router, Router interface Configuration, Configuration of Static Routing, Configuration of Dynamic Routing OSPF and RIP, NAT configuration, Introduction to switching, Basic Configuration of Switch, Configuration of

Catalyst switches Switch security, Configuration of VLAN and Inter VLAN Routing, Configuration of STP, RSTP, Introduction to Wireless devices & Basic Configuration of wireless devices, Securing wireless access point.

Reference:
1. Computer Networks Tanenbaum A. S
2. Computer Networks Stalling W
3. Data Communication and Networking Behraj A Forouzan

CN 522 NETWORK ANALYSIS AND DESIGN:

Switching & Queuing, Framing, Error & Flow Control, Medium Access, Shortest Path Algorithms, Network Design Requirement (Objective), Structured Network Design; Core, Distribution and Access Network, IP Address Allocation, Secure Wireless Network, Network Optimization; Routing and Flow, Network Security and Management; Traffic Control, Internet Architecture.

CN 523 GRAPH THEORY AND ALGORITHMS:

Introduction to Graph Theory, Planar Graphs, Trees, Optimization and Matching, Connectivity of graphs, Graph colouring, Graph Algorithms, Network Flows.

References :
1. Graph, Network and Algorithm Dieter Jungnickel
2. Graph Theory with applications J A Bondy and U S R Murty

CN 531 DATA MINING AND WAREHOUSING:

Basic concept of Data ware house, OLAP and Data mining. OLTP vs. OLAP. Data Warehouse Design - Identifying facts & dimensions, designing fact tables, dimension tables, star flake schema query redirection. OLAP operations Data ware house architecture, Multidimensional schemes:- partitioning strategy, aggregation, data marting, metadata. Capacity planning, tuning the data warehouse testing the data warehouse: developing test plan, testing operational environment Distributed and virtual data warehouses. Data Mining: Basic concept, a statistical perspective on Data Mining-point estimation, models based on summarization, Bayes theorem, Hypothesis Testing, Classification issues, statistical-based algorithms, distance-based algorithms, decision tree-based algorithms and rule based algorithms. Clustering - similarity and distance measures, outliers" hierarchical algorithms, partition algorithms, clustering large databases. Association Rules, large item sets, Apriori algorithm, sampling algorithm, partitioning, parallel and distributed algorithms, data parallelism task parallelism. Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining. Spatial Mining,

Special data overview, Special data mining primitives, generation and specialization, spatial rules, spatial classification algorithms. Temporal Mining modelling temporal events, time series, pattern detection Sequences, temporal association rules. Privacy issues with respect to invasive use.

References :
1. Building the data warehouse , W.H Inmon
2. Data mining concepts and techniques, Jimali Han and Micheline Kamber
3. Data Mining Introduction and Advance Topic, Margaret H. Dunham and S. Sridhar

CN 532 OPERATING SYSTEM AND DESIGN:

Computer system and operating system overview, Operating system functions and design issues, Design approaches, Types of advanced operating systems, Process abstraction, Process management, system calls, Threads, Symmetric multiprocessing and microkernels. Scheduling: Uniprocessor, Multiprocessor and Real time systems, concurrency, classical problems, mechanisms for synchronization: semaphores, monitors, Process deadlock and deadlock handling strategies, Memory management, virtual memory concept, virtual machines, I/O management, File and disk management, Operating system security. Distributed Operating system: architecture, Design issues, Distributed mutual exclusion, distributed deadlock detection, shared memory, Distributed scheduling. Multiprocessor operating systems: architecture, operating system design issues, threads, process synchronization, process scheduling, memory management, reliability and fault tolerance.

References:
1. Advanced concept in operating system: M. Singhal, N.G Shivratri
2. Operating system internal and design princilples: William stallings

CN 533ADVANCED DATA STRUCTURES:

Review of algorithm analysis, Optimal Binary search trees, Balanced binary search trees, Binary heaps, Advanced heap structures, Binomial heaps, Fibonacci heaps. Amortized analysis, Splay trees. Dictionaries, Disjoint set structures. Data Structures for External Memory, External sorting, String matching. Introduction to Randomized Data structures and algorithms.

References:
1. Introduction to algorithms Cormen and Rivest
2. Randomized algorithms R.Motwani and P. Raghavan

CN 534 ARCHITECTURE OF LARGE SYSTEMS :

Pipeline processor principles and design, Instruction set architecture; Memory addressing; Instruction composition; Instruction-level parallelism. Hazards: dynamic scheduling, branch prediction; Memory hierarchy; Processor case studies; Multiprocessor introduction: Shared-memory architectures and their synchronisation and consistency issues, Advanced multi-core topics; Transactional Memory; Interconnection networks.

References:
1. Computer Architecture: A Quantitative Approach, J. L. Hennessy and D. A
2. .Parallel Computer Architecture: A Hardware/Software Approach, David Culler, J.P. Singh and Anoop Gupta
3. Advanced Computer Architecture: Parallelism, Scalability, Programmability, Kai Hwang,.

CN 535 COMPUTER & NETWORK SECURITY:

Introduction to computer and network security. Basic concepts, threat models, common security goals, security policies, security mechanisms, Attacks, security tools, Cryptography and cryptographic protocols, Secret Key Cryptography , public-key cryptography, authentication, message authentication codes, hash functions, one-way functions, Message Digests , Hash And Mac Algorithms, secure channels. Malicious code analysis and defense. access control, digital signature standards (DSS), Kerberos, IPsec,Electronic Mail Security, X.509, Firewalls and Web Security, trusted system, intrusion detection systems, DoS attacks and defense, Cyber crime .

References:
1. Cryptography and Network Security: Principles and Practice William Stallings

CN 536 CYBER CRIME AND INFORMATION WARFARE:

Introduction of cyber crime, challenges of cyber crime, categorizing cyber crime, cyber terrorism, virtual crimes, perception of cyber criminals: hackers, insurgents and extremist groups,Interception of data, surveillance and protection, criminal copy right infringement, cyber stalking. Hiding crimes in cyberspace and methods of concealment. Anonymity and markets, privacy and security at risk in the global information society. Privacy in cyber space, web defacements and semantic attacks, DNS attacks, code injection attacks. Information Warfare concept, information as an intelligence weapon, attacks and retaliation, attack and defence. An I-War risk analysis model, implication of I-WAR for information managers, Perceptual Intelligence and I-WAR, Handling Cyber Terrorism and information warfare, Jurisdiction.

References:
1. Principles of Cyber crime, Jonathan Clough Cambridge University Press
2. Information Warfare : Corporate attack and defense in digital world, William Hutchinson, Mathew Warren, Elsevier

CN 537 ADVANCED COMPUTER NETWORKS:

Review of networking concepts: Network models, Addressing, Data rate limits, Bandwidth, throughput, Latency, Data link control, Multiple Access,Wired LAN, Wireless LAN, VLAN, SONET, ATM, QoS in ATM, ATM applications, IP addressing, forwarding, and routing, IPv4, IPv6, IP Security, Virtual Private Networks, Transport layer protocol, congestion control, Multimedia Networks: Voice/Video over IP, IP Telephony, Voice over ATM, AAL2, Network management, Optical Networks.

Reference:
1. Andrew S. Tanenbaum : Computer networks

CNE 538 NATURAL LANGUAGE PROCESSING:

Regular Expressions and Automata, N-grams, Part-of-Speech Tagging, Hidden Markov and Maximum Entropy Models, Formal Grammars of English, Syntactic Parsing, Statistical Parsing, Features and Unification, Language and Complexity, The Representation of Meaning, Computational Semantics, Computational Lexical Semantics, Information Extraction, Question Answering and Summarization, Machine Translation

References:
1. D. Jurafsky and J. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition.
2. C.Manning and H. Schutze , Foundations of Statistical Natural Language Processing

CN 539 OPTICAL NETWORKS:

Interconnection networks; Networks: Introduction to computer data networks, ISO-OSI models, SDH, SONET; Fiber-optic LAN architectures and protocols- ring, star and bus architectures, DQDB, FDDI; High speed bus protocols-, WDM Network design - Lightpath Topology, All Optical Networks.

References:
1. High Sped Networks & Internet William Stalling,
2. Optical Networks Rajiv Ramaswamy and Kumar N. Sivarajan

CN 540 DIGITAL STEGANOGRAPHY AND WATERMARKING:

Steganography: Overview, History, Methods for hiding (text, images, audio, video, speech etc.), Issues:Security, Capacity and Imperceptibility, Frameworks for secret communication (pure Steganography, secret key, public key steganography), Steganography algorithms (adaptive and non-adaptive), Steganography techniques:Substitution systems, Spatial Domain, Transform domain techniques, Spread spectrum, Statistical steganography, Cover Generation and cover selection, Tools :EzStego, FFEncode, Hide 4 PGP, Hide and Seek, S Tools etc.) Steganalysis: Active and Malicious Attackers, Active and passive steganalysis, Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysis using primary sets, Texture based Watermarking: Introduction, Difference between Watermarking and Steganography, History, Classification (Characteristics and Applications), Types and techniques (Spatial-domain, Frequency-domain, and Vector quantization based watermarking), Attacks and Tools (Attacks by Filtering, Remodulation, Distortion, Geometric Compression, Linear Compression etc.), Watermark security & authentication

References:
1. Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Margan Kaufmann Publishers, New York, 2008.
3. Information Hiding: Steganography and Watermarking-Attacks and Countermeasures by Neil F. Johnson, ZoranDuric, SushilJajodia
4. Information Hiding Techniques for Steganography and Digital Watermarking by Stefan Katzenbeisser, Fabien A. P. Petitcolas

CN 541 SECURE SOFTWARE ENGINEERING:

Software Project Management, Metrics and measurement, Software Configuration management, Software risk management, Requirements Engineering, Software quality assurance, software reliability models. Object oriented design, object oriented programming (with C++), Formal specifications, Formal verification of programs, Jackson method for design, CASE tools and technology, Clean room method for software development, Information system design, Real-time software specification and design. Enterprise architectures, Zachman"s Framework, Architectural styles, Design Patterns, Architecture Description Languages, Product-Line architectures, Component Based Development.

References:
1. An integrated approach to Software Engineering, Pankaj Jalote.

2. Software Engineering: A Practitioner approach Roger Pressman.
3. Software Architecture in Practice. Len Bass, Paul Clements, Rick Katzman, Ken Bass
4. Software Engineering, L. Pfleeger. 1595. Pattern Oriented Software Architecture, Volumes 1 & Stal, Doughlas Schmidt

CN 542 SIMULATION AND MODELLING:

Introduction: Systems, modelling, general systems theory, Concept of simulation, Simulation as a decision making tool, types of simulation. Random Numbers and Queuing Theory: Pseudo random numbers, methods of generating random variables, discrete and continuous distributions, testing of random numbers, Concepts of Queuing theory. Design of Simulation Experiments :Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation validation. Simulation Languages: Comparison and selection of simulation languages, study of these simulation language. Case studies: Development of simulation models using simulation language studied for systems like queuing systems, Production systems, Inventory systems, maintenance and replacement systems and Investment analysis.

References
1. System Simulation Geoffrey Gordon
2. System Simulation with Digital Computer Narsingh Deo

CN 543 CRYPTOGRAPHY:

Introduction to cryptography.Security Attacks, mechanism and Services. Cryptosystems, Conventional encryption model and techniques, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Block ciphers principals, fiestal structure, SPN, DES, triple DES, AES,IDEA encryption and decryption, key distribution. finite field: Introduction to graph, ring and field, modular arithmetic, Fermat"s and Euler"s theorem, Euclid"s Algorithm, Chinese Remainder theorem, Entropy and huffman"s coding,Comparison of symmetric and public-key cryptographic systems, Principals of public key crypto systems, RSA algorithm, Diffle-Hellman key exchange algorithm, Message Authentication and Hash Function: security of hash functions and MACS, MD5 message digest algorithm, secure hash algorithm (SHA). Digital Signatures.

Reference:
1. Cryptography and Network Security: Principles and Practice William Stallings,
2. Cryptography Theory and Practice Douglas R. Stinson

CN 544 Web Search and Information Retrieval

Information retrieval model, Information retrieval evaluation, Searching the web, Document Representation, Query languages and query operation, Metadata search, Indexing and searching, Scoring and ranking feature vectors, Ontology, domain specific search, Parallel and distributed information retrieval, Text and multimedia languages, Social networks

References:
1. Manning, C., Raghavan, P., and Schutze, H. (2007), An introduction to Information Retrieval, Cambridge University Press
2. Chakrabarti, S. (2002). Mining the web: Mining the Web: Discovering knowledge from hypertext data. Morgan-kaufman

CN 545 SECURE CLOUD COMPUTING

Cloud computing fundamental: Definition of Cloud computing, Cloud computing models, cloud computing architecture, essential characteristic, Virtualization basic, server consolidation, automatic computing, horizontal scaling, high performance computing. Cloud security: cloud security fundamental, cloud information security objective, cloud security services, End-user access to the cloud computing, identity management and access control, cloud computing risk, cloud computing security challenges, security analysis, real time risk management in cloud computing, trusted cloud computing, hardware based security to ensure data privacy, virtualization system-specific attacks, guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, virtual thread, VM security recommendation, VM migration attack, hyper jacking. Legal and compliance issues responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer, VM specific security technique.

Reference
1. Anothony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, MGH, 2010.
2. Gautam Shroff, Enterprise Cloud Computing, Cambridge, 2010.
3. Ronald Krutz and Russell Dean Vines, Cloud Security, 1st Edition, Wiley, 2010.
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing By Ronald L. Krutz, Russell Dean Vines, 2011

CN 546 EMBEDDED SYSTEMS

Introduction, Hardware & electronics fundamentals, Peripherals, Program Design and Analysis, Processes and Operating system, Real time Operating system Memory,

Interfacing, Examples of Embedded systems: Digital Camera Examples, Smart card application, Embedded database applications, etc State Machine and Concurrent Process Models, Control Systems Verilog programming, Programming of mobile and Hand-held devices. IC Technology Full-Custom (VLSI) IC Technology, Semi-Custom (ASIC) IC Technology, Programmable Logic Device (PLD) IC Technology, FPGA. Hardware Software Partitioning, Hardware/Software Co-Simulation, Intellectual Property Cores, Low Power design

References
1. Embedded system Design Frank Vahid, Tony Givargis
2. Computer as Components Wayne Wolf,
3. 8051 Microcontroller an Application Based introduction, Braithwaite Cowan,Parchizadeh
4. 8051 Microcontroller & Embedded Systems Rajiv Kapadia
5. The 8051 Microcontroller & Embedded Systems Mazidi & Mazida

CN 547 AD HOC AND SENSOR NETWORKS

Introduction of ad-hoc/sensor networks: key definitions, advantages, unique constraints and challenges, applications, and wireless communications/radio characteristics. Media Access Control and routing protocols for Ad-Hoc wireless networks: issues, classification and protocols. Networking Sensors: features, deployment of sensor networks, sensor tasking and control. Sensor Network platforms and tools :Berkley Motes ,Sensor network programming challenges ,Embedded Operating System.
Transport layer, QoS issues and security protocols for ad hoc and sensor networks. Simulators for wireless ad hoc and sensor networks. Applications of Ad-Hoc/Sensor Network and Future Directions.

References:
1. Ad hoc Wireless Networks C. Siva Ram Murthy & B. S. Manoj
2. Wireless Sensor Networks: An Information Processing Approach Feng Zhao and Leonidas J. Guibas

CN 548 DATA COMMUNICATION

OSI and TCP/IP reference models, circuit, message, packet and hybrid switching, broadband ISDN and ATM, transmission media used in physical layer, LAN, MAN and WAN, LAN protocols, IEEE standards for LAN and MAN, Data link layer protocols, Network layer design issues, Introduction to routing and congestion, routing and congestion control algorithms, inter networking, The transport service, Elements of transport protocols, Data security and cryptography techniques, access management in application layer, virtual terminals. Study of standard networks.

References:
1. Data and Computer Communications William Stallings
2. Data Networks Dimitris Bertsekas and Robert Galliger,
3. Computer Networks Tanenbaum

CN 549 COMPUTATIONAL INTELLIGENCE:

Introduction to neural networks, Working of an artificial neuron, Perceptron, Back propagation algorithm, Adalines and Madalines. Supervised and unsupervised learning, Counter-propagation networks, Adaptive Resonance Theory, Kohonen's Self Organizing Maps, Neocognitron, Associative memory, Bidirectional Associative Memory.

Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules, Process control using fuzzy logic, Decision-making fuzzy systems, Applications of fuzzy logic, Hybrid systems like neuro-fuzzy systems.

Evolutionary Computation: Population-based Search: genetic algorithms and evolutionary computation, Genetic Programming. Swarm optimization, Ant colony optimization. Search techniques like Simulated Annealing, Tabu search etc.

References:
1. Soft Computing and Intelligent Systems Design F.O.Karray and C.De Silva,
2. Neural Networks, Fuzzy Logic and Genetic Algorithms Rajsekaran and Pai

OPEN ELECTIVES

CN 551 BIOMETRICS:

Introduction: Definitions, biometric modalities, benefits of biometric versus traditional authenticated methods. Key biometric terms and processes. Authenticationtechnologies: storage tokens, dynamic tokens, token usability. Design of a Biometric System: Building blocks, Modes of operation. Biometric technologies: Passive & active biometric. user acceptance Ease of use ,technology cost, depoyability,Invasivness of the technology , maturity of the technology. Fingerprint verification: Minutiae Based Fingerprint Matching, Non-minutiae Based Representations,finger print component, algorithms for interpretion.Fingerprint Enhancement, and Fingerprint Classification. Face Recognition:- Introduction, Authentication vs. Identification, Challenges in Face recognition, Algorithms for face recognitions. Iris Recognition: Introduction, devices for capturing Iris, Iris representation schemes, Iris recognition algorithms. Hand Geometry Recognition , Gait Recognition, The Ear as a Biometric, Voice Biometrics, A Palmprint Authentication System. On-Line Signature Verification.3D Face Recognition. Automatic Forensic Dental Identification,DNA. Introduction to Multibiometrics.- Multispectral Face Recognition.- Multibiometrics Using Face and Ear.- Incorporating Ancillary Information in Multibiometric Systems. Multimodal Biometrics: Limitations of unimodal systems, multibiometric scenarios, levels of fusion, system design, score fusion techniques, score normalization, user-specific parameters, and soft biometrics. The Law and the Use of Biometrics.- Biometric System Security.- Spoof Detection Schemes.- Linkages between Biometrics and Forensic Science.- Biometrics in Government Sector.- Biometrics in the Commercial Sector.- Biometric Standards.- Biometrics Databases Case Study Presentations: Biometrics in Banking Industry, Biometrics in Computerized, Patient Records, Biometrics in Credit Cards, Biometrics in Mass Disaster Victim, Identification Forensic Odontology

References:
1. Biometrics for network security PaulReid,
2. Handbook of Fingerprint Recognition D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar,
3. BIOMETRICS: Personal Identification in Networked Society A. K. Jain, R. Bolle, S. Pankanti,
4. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K. Jain, D. Maltoni, and D. Maio

CN 552 OPTIMIZATION TECHNIQUES:

Introduction: Maximization and minimization problems- examples. Basic concept of optimization – Convex and concave functions, Necessary and sufficient conditions for stationary points. Degree of freedom. Formulation: Economic objective function. Formulation of various process optimization problems and their classification. Optimization of unconstrained and constrained search: Optimization of one dimensional function, unconstrained multivariable optimization direct search methods. Indirect first order and second order methods, constrained multivariable optimization - necessary and sufficient conditions for constrained optimum. Linear programming and applications: Geometry of linear programs, Simplex Algorithm its applications. Non- linear programming with constrained and its applications: Quadratic programming, Generalized reduced gradients methods, Successive linear and successive quadratic programming, Dynamic programming, Integer and mixed integer programming.

Application of optimization in chemical engineering: Optimization of staged and discrete processes, Optimal shell-tube heat exchanger design, Optimal pipe diameter, Optimal design of an Ammonia reactor. Nontraditional optimization techniques: Introduction and application areas.

References:
1. Optimization of Chemical Process Edger T. F. and Himmelblau D. M
2. Optimization Theory and Practice Beveridge G. S. and Schechter R. S .
3. Engineering Optimization Methods and Applications Rekllaities F. V., Ravindan A. and
   Ragsdell K. M.
4. Engineering Optimization Rao S.

CN 553 DISTRIBUTED COMPUTING:

Introduction to Distributed System: Goals, Hardware concepts, Software concepts, and Client-Server model. Example of distributed systems. Communication: Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication. Inter process communication in UNIX/LINUX. Processes: Threads, Clients, Servers, Code Migration, Software agent.Naming: Naming entities, locating mobile entities, removing un-referenced entities. Synchronization: Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions. Consistency and Replication: Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols. Fault Tolerance: Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery. Security: Introduction, Secure channels, Access control, Security management. Distributed File System: Sun network file system, CODA files system, Google File System.

References:
1. Distributed Systems: Principles and Paradigms. Taunenbaum
2. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg,

CN 554 INFORMATION THEORY AND CODING:

Information and entropy information measures, Shannon‟s concept of information. Channel coding, channel mutual information capacity (BW) , theorem for discrete memory less channel, information capacity theorem , error detecting and error correcting codes, Types of codes: block codes, hamming and Lee metrics, description of linear block codes , parity check codes ,cyclic code. Masking techniques. Compression : loss less and lossy, Huffman codes, LZW algorithm, Binary image compression schemes, run length encoding, CCITT group 3 1-D compression, CCITT group 3 2D compression, CCITT group 4 2D Compression. Convolutional codes, sequential decoding. Video image compression: CITT H 261 Video coding algorithm, audio (speech) compression. Cryptography and cipher.

References:
1. Information Theory, Coding and Crptography R Bose
2. Multimedia system Design Prabhat K Andleigh and Kiran Thakrar
3. Multimedia Communications Fred Halsall

CN 555 Cluster and Grid Computing:

Cluster Computing: Introduction, Hardware for cluster computing, Software architectures for cluster computing based on shared memory (OpenMP) and message-passing (MPI/PVM) models, Performance evaluation tools, Configuring and Tuning Clusters.
Grid Computing: The Evolution Grid Technologies, Programming models - A Look at a Grid Enabled Server and Parallelization Techniques, Grid applications, Grid architecture, Grid relationship to other Distributed Technologies, Computational and Data Grids, Semantic grids, Grid Management systems: Security, Grid-Enabling software and Grid enabling network services, Virtualization Services for Data Grids; Case Study, Setting up Grid, deployment of Grid software and tools.

References:
1. R. Buyya, High Performance Cluster Computing , Prentice Hall, USA, 1999.
2. Parallel Programming with MPI by Peter Pacheco, Morgan Kaufmann, 1998.
3. I. Foster and C. Kesselman, The Grid : Blueprint for a New Computing Infrastructure , Morgan Kaufmann Publishers , 1999.

CNE 561 CLOUD COMPUTING:

Cloud Computing: Introduction, Working of cloud computing, benefits;

Understanding Cloud Computing: Developing cloud computing services, Discovering cloud services; Cloud Computing for Everyone: Centralizing email communications, Cloud computing for community; Cloud Computing for the Corporation: Managing Schedules, Managing Projects; Using Cloud Services: Collaborating on Calendars, Schedules, and Task Management, Collaborating on Project Management. Outside the Cloud: Other Ways to Collaborate Online: Collaborating via Web-Based Communication Tools, Collaborating via Social Networks and Groupware.

References:
1. Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.
2. Implementing and Developing Cloud Computing Applications by DAVID E.Y. SARNA, CRC Press

CN 562 DIGITAL IMAGE PROCESSING:

 Introduction to Image Processing Systems, Digital Image Fundamentals:- Image model, Relationship between Pixels, Imaging geometry, Camera model. Image Sensing and Acquisition. Sampling and quantization. Image Enhancement and in spatial Domain: Point processing, Neighbourhood Processing, High pass filtering , High boost filtering, zooming. Image Enhancement based on Histogram medelling. Image Enhacement in frequency domain: 1D& 2D Fourier transform, Low pass frequency domain filter, High pass frequency domain filters, Homomorphics filtering. Image Segmentation:- Detection of discontinuation by point detection, line detection, edge detection. Edge linking and boundary detection:- Local analysis, global by graph, theoretic techniques. Thresh-holding. Morphology, Representation and description. Discrete image transform. Image Compression. Wavelet transformation.

References:
1. Digital Image Processing Gonzalez & Wood
2. Digital Image Processing A.K.Jain
3. Image Processing Dhananjay K. Techkedath

CN 563 CAD OF DIGITAL SYSTEMS:

Basic Mathematical Concepts, Introduction to design methodologies, Design automation tools, Algorithmic graph theory and computational complexities, Computational Approaches and methods for combinatorial optimization, Design of digital hardware and HDLs, Introduction to logic circuits, Implementation technologies, Verilog Programming concepts, Gate level modelling , Data flow modelling , Behavioural modelling,

Combinational circuit design, Flip- flops, registers, counters and processor, Sequential circuits design, Tasks and functions, Timing and Delays ,Data Structure in VLSI design , Layout, placement and partition, floor planning, routing, Logic Synthesis, Model Optimization, Verification and Testing , Simple Microprocessor Design .

References:
1. Algorithm for VLSI Design automation Sabih H. Gerez
2. Fundamental of Digital Logic with Verilog Design, Brown & Vranesic
3. Verilog HDL Samir Palnitkar
4. Digital VLSI Design with Verilog, John Williams

CN 564 OBJECT ORIENTED MODELLING, ANALYSIS AND DESIGN:

Object Orientation, OMT Methodology, Object and Class, Link and Association Generalization, Aggregation Multiple Inheritance, Packages. Object Meta modelling, Metadata and Metamodels, Functional Modelling. Pseudocode, Pseudocode with the Object Navigation Notation, ONN Constructs, combining ONN Constructs. Analysis: Object Model, Data Dictionary, Dynamic Model, Functional Model. System Design: Devising an Architecture, Database Management Paradigm, Object Identity, Policies for Detailed Design Dealing with temporal data. Detailed Design:- Object Model Transformations, Elaborating the Object Model, Elaborating the Functional Model, Evaluating the Quality of a Design Model

References:
1. Object-Oriented Modeling and Design by Michael Blaha / William Premerlani, Prentice Hall

CN 565 TECHNICAL FOUNDATION FOR E-COMMERCE:

Introduction: Electronic commerce, technology and prospects, forces behind e-commerce, advantages and disadvantages, architectural framework, e-commerce strategy, e-commerce emerging issues and implementation issues, e-commerce law, government policies and agenda.

E-Commerce Infrastructure: Internet and Intranet based e-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN,FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile information device, mobile computing applications , security issues in m-commerce. Electronic Payment System: Overview, electronic payment mechanisms and protocols, SET protocol, payment gateway, certificate, digital tokens, smart card, credit card, magnetic strip card, electronic money, electronic contracts, micro-payments, e-checks, e-cash Credit/Debit card based EPS, e-commerce payments security, online banking. electronic data

interchange and its applications. Internet Advertising. Models of Internet advertising, sponsoring contents, corporate website, weaknesses in Internet advertising, web auctions and trading mechanism. Securing Business on Network. Security policies, procedures and practices, site security, firewalls, securing web service, transaction security, cryptology, cryptological algorithms, public key algorithms, authentication protocols, digital Signatures, virtual private network, security protocols for web commerce. Advanced Topics. Electronic commerce optimization algorithms, decision support systems for e-commerce, data mining for e-commerce, intelligent techniques for e-commerce.

References:
1. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
2. E-Business Organizational and technical foundation (Michael P) Wiley Publication
3. John Benamati ,William S.Davis, E-Commerce Basics Technology Foundations and E-Business Applications, Prentice Hall