DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
TRIGUNA SEN SCHOOL OF TECHNOLOGY
ASSAM UNIVERSITY: SILCHAR

Course Structure of M. Tech (CSE) Programme under TSSOT (2016-17)

First Semester

A. THEORY							
SL. NO	COURSE CODE	COURSE NAME	CONTACT PERIOD/WEEKS				CREDITS
			L	T	P	Total	
1.	CSECF01	**Mathematical Foundation for Computer Science**	4	2	--	5	5
2.	CSECF02	**Programming and Data Structures**	4	2	--	5	5
3	CSECC01	**Computer Networks**	4	2	--	5	5
4.	CSECC02	**Advanced Operating Systems**	4	2	--	5	5
5.	CSEDE01	**Elective Discipline - 1**	4			4	4
6.	CSE0E01	**Elective Open - 1**	4			4	4
B. PRACTICAL							
7.	CSECF03	**Programming and Data Structures Lab**			4	4	2
8.	CSECC03	**Advanced Operating Systems Lab**			4	4	2
9.	CSECC04	**Computer Networks Lab**			4	4	2

Second Semester

A. THEORY							
SL. NO	COURSE CODE	COURSE NAME	CONTACT PERIOD/WEEKS				CREDITS
			L	T	P	Total	
1.	CSECC04	**Design & Analysis of Algorithms**	4	2	--	5	5
2.	CSECC05	**Advanced DBMS**	4	2	--	5	5
3	CSECC06	**Advanced Computer Architecture**	4	2	--	5	5
4.	CSEDE02	**Elective Discipline - 2**	4			4	4
5.	CSEDE03	**Elective Discipline - 3**	4			4	4
6.	CSEDE04	**Elective Discipline - 4**	4			4	4
7.	CSE0E02	**Elective Open - 3**	4			4	4
B. PRACTICAL							
8.	CSECF07	**Advanced DBMS Lab**			4	4	2
9.	CSEPT	**Seminar**					2

Third Semester

A. THEORY							
SL. NO	COURSE CODE	COURSE NAME	CONTACT PERIOD/WEEKS				CREDITS
			L	T	P	Total	
1.	CSEPT02	**Project Dissertation - I**			40	40	20
2.	CSEPT03	**Grand Viva**					10

Fourth Semester

A. THEORY							
SL. NO	COURSE CODE	COURSE NAME	CONTACT PERIOD/WEEKS				CREDITS
			L	T	P	Total	
1.	CSEPT02	**Project Dissertation - II**		20	40	60	30

List of Electives (Discipline) Courses:

1. Cryptography & Information Security	11.VLSI Design & Algorithm	21.Data Warehousing
2. Distributed Systems	12.Soft Computing	22.Advanced Algorithm Design
3.Graph Theory	13.Computer Vision	23.Natural Language Processing
4.Artificial Intelligence	14.Cloud Computing	24.Theory of Computation
5.Computer Graphics & Multimedia	15.Web Service and Service Oriented Architecture	25.Advanced Java Programming
6.Data Mining	16.Script Programming	26.Enterprise Resource Planning
7.Advanced Computer Architecture	17.Software Engineering	27.Fuzzy System
8.Mobile Computing	18.Image Processing	28.Neural Networks
9.Pattern Recognition	19.Advanced Operating Systems	29.Network on Chip
10.Information Retrieval	20.Quantum Computing	30.Formal System Verification

List of Elective (Open) Courses:

1. Web Technology	2. Java Programming	3. Research Methodology
4. GIS & Remote Sensing	5.Matlab	

Detailed Syllabus for M. Tech in Computer Science Engineering

CSECF 01: Mathematical Foundation for Computer Science

Unit I: Discrete Mathematics:

Basic Structures: Sets; Relations; Functions; Groups and Rings; Boolean algebra;

Unit II: Mathematical Reasoning, Logic and Proofs:

Boolean logic: Properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples;

Unit III: The Fundamentals: Algorithms, the Integers, and Matrices:

Basic concept of algorithms; The Growth of Functions; Complexity of Algorithms; The Integers and Division; Applications of Number Theory; Divisibility, modular arithmetic (addition modulo and multiplication modulo);

Unit IV: Graph Theory:

Properties of Graphs, isomorphism, complete graphs, bipartite graphs, matching, colourability, planarity, trees and fundamental circuits, cut-set and cut-vertices

Unit V: Modeling Computation:

Introduction To Finite Automata: Alphabets, strings and languages, deterministic finite automata, non-deterministic finite automata, types of grammars and languages, Language Recognition, Turing Machines.

Text Books:

1. C L Liu, " Elements of Discrete Mathematics", McGraw Hill
2. Kenneth H Rosen "Discrete Mathematics and its Applications", McGraw Hill (Seventh edition)

Reference books:

1. J L Hein, Discrete Structures, Logic, and Computability, 3/e, Jones and Bartlett, 2010.
2. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson
3. N Deo, Graph Theory, Prentice Hall of India, 1974.
4. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R. Manohar
5. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)

CSECF 02: Programming and Data Structures

UNIT I. Introduction

Basics of C programming, array, functions, pointers, structures, union, string, file handling, parameters passing templates, using matrices, Basics of time complexity estimates, General norms for running time calculation

UNIT II. Liner Data structures

Abstract data types, linked list, doubly linked list circular linked list, representation and implementation of stack and queue

UNIT III.Non Linear Data Structures

Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

UNIT IV. Searching and Sorting

Sorting and Searching Algorithms- Bubble sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and Radix Sort; Linear Search and Binary Search.

UNIT V. Hashing and Graph theory

Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing, Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search, Introduction to NP-Completeness.

Text Book:

Data Structures & Algorithm Analysis in C++ , Mark Allen Weiss. Second edition, Pearson Edition. Asia.

Reference Books:

1. Data Structures & Algorithm in C++, Adam Drozdek. Vikas publication House.
2. Data Structure, Algorithm and OOP, Gregory L. Heileman (Tata Mc Graw Hill Edition

CSECC 01: Computer Networks

Unit-I:

Communication media, coding, modulation and demodulation, modem standards.Transmission modes, Analog and Digital Signal Transmission, Multiplexing, error detection and correction. Interfaces for data communication, Network topology [8L]

Unit-II:

Data link layer: Framing, Error control, Flow control,Data Link layer Protocols
Medium access sub layer: Channel Allocation problem; Multiple access protocols [8L]

Unit-III:

Network layer: Addressing: IPv4 and IPv6 , subnetting; Routing : Routing table , Routing algorithms, Unicast and multicast routing protocols, ARP, RARP, IP, ICMP

Transport layer: UDP; TCP,SCTP, Congestion control algorithms, Quality of service: techniques to improve Qos. [8L]

Unit-IV:

Application layer: **Client Server Model, Socket Interface, Domain Name System (DNS), Application layer** protocols
Security: Symmetric Encryption Algorithms, Public Key Cryptography: Key Exchange Algorithms, Public-Key Cryptography Standards, security protocols in internet, Digital Signatures, Authentication of Systems, Firewalls. [8L]

Unit-V:

ATM, Frame Relay,Wireless LAN: IEEE 802.11;Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network [8L]

Text Books:

1. A. S. Tanenbaum, Computer Networks (4th Ed.), Pearson Education/PHI
2. W. Stallings, Data and Computer Communications (5th Ed.), PHI/ Pearson Education
3. B. A. Forouzan, Data Communications and Networking, (3rd Ed.), TMH
4. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley.
5. Black, Data & Computer Communication, PHI

References*:*

1. William Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall of India. Leon, Garica, Widjaja, Communication Networks, TMH
2. "Mobile Communication", J. Schiller, Pearson Education

CSECC 02: Advanced Operating Systems

Unit I:

Architectures of Distributed Systems - System Architecture types - issues in distributed operating systems - communication networks – communication primitives.Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs.

Unit II:

Theoretical Foundations - inherent limitations of a distributed system – lamport's logical clocks – vector clocks – casual ordering of messages – global state – cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis.

Unit III:

Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems – issues in deadlock detection and resolution – control organizations for distributed deadlock detection – centralized and distributed deadlock detection algorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture – mechanism for building distributed file systems – design issues – log structured file systems.

Unit III:

Distributed shared memory-Architecture– algorithms for implementing DSM – memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – components of a load distributing algorithm – stability – load distributing algorithm – performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing -task migration and associated issues.

Unit IV:

Failure Recovery and Fault tolerance: introduction– basic concepts – classification of failures – backward and forward error recovery, backward error recovery- recovery in concurrent systems – consistent set of check points – synchronous and asynchronous check pointing and recovery – check pointing for distributed database systems- recovery in replicated distributed databases.

Unit V:

Multi – Processor operating system Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory Management – Reliability / Fault Tolerance; Database Operating Systems – Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms.

Textbook:

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001

Reference:

2. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003
3. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003

CSECF 03: Programming and Data Structure Lab

As per Theory of CSECF 02

CSECC 03: Advanced Operating Systems Lab

As per Theory of CSECC 02

CSECC 04: Computer Networks Lab

Simulation experiments for protocol performance, configuring, testing and measuring network devices and parameters/policies; network management experiments; Exercises in network programming.

ELECTIVE DISCIPLINE (CSE DE)

CSEDE 06-Data Mining

Unit 1: Data Mining : Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Unit 2: Data Warehousing and Business Analysis: - Data ware housing Components –Building a Data warehouse – A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology. DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis, From Data warehousing to Data Mining.

Unit 3: Concept Description : Data Generalization & Summarization – Based Characterization, Analytical Characterization, Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases

Mining Association Rules in Large Databases : Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi-Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining.

Unit 4:Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit 5: Cluster Analysis : Types of Data in Cluster Analysis, Partitioning methods, Hierarchical methods, Density – Based Methods, Grid – Based Methods, Model – Based Clustering Methods, Outlier Analysis.**Mining Complex Types of Data.**

Text Books :

1. Jiawei Han &MichelineKamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Linited.
2 Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

Reference Books :

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson& S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007

CSEDE 29: Network – On – Chip

Unit 1:Introduction to Interconnection Networks: Uses of Interconnection Networks - Processor-Memory Interconnect, I/O Interconnect, Packet Switching Fabric.
Network Basics: Topology, Routing, Flow Control, Router Architecture, Performance of Interconnection Networks: Case study with a simple interconnection network.

Unit 2:Topology Basics: Channels and Nodes, Direct and Indirect Networks, Cuts and Bisections, Paths, Symmetry.
Traffic Patterns, Performance: Throughput and Maximum Channel Load, Latency, Path Diversity
Case Study: Butterfly and Torus Networks.

Unit 3: Non-Blocking Networks: Non-Blocking vs. Non-Interfering Networks, Crossbar Networks, Close Networks, Beneˇs Networks, Sorting Networks
Slicing and Dicing: Concentrators and Distributors,Bit Slicing, Dimension Slicing, Channel Slicing,Slicing Multistage Networks.

Unit 4: Routing Basics:A Routing Example, Taxonomy of Routing Algorithms, The Routing Relation, Deterministic Routing, Oblivious Routing, Adaptive Routing, Routing Mechanics.

Unit 5: Flow Control Basics: Resources and Allocation Units, Buffer less Flow Control, Circuit Switching, Buffered Flow Control.
Deadlock and Livelock: Deadlock, Deadlock Avoidance, Adaptive Routing, Deadlock Recovery.
Quality of Service.

Textbook:
William James Dally, Brian Towles,PRINCIPLES AND PRACTICES OF INTERCONNECTION NETWORKS, Morgan Kaufmann Publishers

CSEDE08: Wireless and Mobile Technology

UNIT-I:

Introduction: Evolution of Mobile Radio communication, various generation of wireless networks,Example of Wireless communication, Wireless Local Area Networks (WLANs),IEEE 802.11 standards

Challenges in mobile computing

Wireless Transmission: Description of cellular system, Frequency Reuse, Co-channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception , **channel allocation**

Unit II:

Evolution of Modern Mobile Wireless Communication System - First Generation Wireless Networks, Second Generation (2G) Wireless Cellular Networks, Major 2G standards, GSM: Architecture and Protocols ,2.5G Wireless Networks, The General Packet Radio Services: (GPRS) , Overview of CDMA systems: IS-95 Networks

Unit III:

Third Generation 3G Wireless Networks, Cellular –WLAN Integration, Introduction to 4G,WiMAX, LTE

Handoff, types of handoffs; location management, HLR-VLR scheme

Unit IV:

Mobile IP, **Mobile TCP**

Publishing & Accessing Data in Air: Pull and push based data delivery models, data dissemination by broadcast, broadcast disks, directory service in air,

Support for mobility: File systems, World Wide web, Wireless application protocol, **Introduction to Mobile development frameworks and tools**, **Mobile operating systems, Mobile agents**

Unit V:

Mobile Ad- hoc Network (MANET): Layered architecture of MANET, Ad hoc network routing protocols, MAC and Transport layer issues of MANET,

Introduction to Wireless Sensor Network and Wireless Mesh Network

Textbooks:

1. J. Schiller, Mobile Communication, Pearson
2. Yu-.Kwong R. Kwok and Vincent K. N. Lau, Wireless Internet and Mobile Computing, John Wiley & Sons ,2007
3. Asoke K. Talukder and Roopa R. Yavagal,Mobile Computing: Technology, Applications, and Service Creation, McGraw-Hill,2006
4. W. Stallings, "Wireless Communications and Networks", Pearson Education, 2002.

References:

1. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”,Wiley,
2. Raj Kamal, Mobile Computing, Oxford University Press,2007
3.Y.B. Lin and I. Chlamtac, Wireless and Mobile network Architectures ,Wiley
4. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, Cambridge University press, 2004
5.C.K.Toh,Ad-hoc Mobile Wireless Networks- Protocols and Systems, Prentice Hall,2007

CSEDE01: Cryptography and Information Security

UNIT-I

Introduction and Mathematical Foundations: Overview on Modern Cryptography ,Ciphers and Secret Messages, Security Attacks and Services. Number Theory , Probability and Information Theory ,Mathematical Tools for Cryptography: Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms. Classical Cryptosystems, Cryptanalysis of Classical Cryptosystems

UNIT-II

Conventional Symmetric Encryption Algorithms: Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB, CBC, OFB, CFB), Strength (or Not) of DES.

Modern Symmetric Encryption Algorithms: IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution. Stream Ciphers and Pseudo Random Numbers: Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad, **Cryptanalysis of Symmetric Key Ciphers**

UNIT –III

Public Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards.

Hashes and Message Digests: Message Authentication, MD5, SHA, RIPEMD, HMAC, **Cryptanalysis of Asymmetric Key Ciphers, Modern Trends in Asymmetric Key Cryptography**

UNIT-IV

Digital Signatures, Certificates, User Authentication: Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems. Authentication of Systems: Kerberos V4 and V5, X.509 Authentication Service. Digital Watermarking and Steganography.

UNIT-V

Network Security: Secret Sharing Schemes, Network Protocols, Pretty Good Privacy (PGP), Secure Socket Layer (SSL), Intruders and Viruses, Firewalls,IPSEC, Private networks access security (L2F, PPTP, L2TP), Web Security, privilege management infrastructure (PMI) and Access Control,security in e-comerce, smart cards

Textbooks:

1. Bruce Schneier, Applied Cryptography (ISBN 0471128457), 2/e
2. William Stallings, Cryptography and Network Security: Principles and Practice (ISBN 0131873164), 4/e
3. Alfred J. Menezes , Handbook of Applied Cryptography
4. Michael Welschenbach , Cryptography in C and C++ (ISBN 1590595025), 2/e
5. Douglas R. Stinson, Chapman & Hall, Cryptography: Theory and Practice, Third Edition CRC (November 1, 2005), (ISBN: 1584885084)

References:

1. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
2. Richard A. Mollin, An Introduction to Cryptography, Chapman and Hall/CRC, 2001.
3. A. Menezes, P. Oorshcot, and S. Vanstone, Handbook of Applied Cryptography, CRC Press, Boca Raton, FL, 1997.
4. Thomas H. Barr, Invitation to Cryptography, Prentice Hall, 2002.
5. Richard J. Spillman, Classical and Contemporary Cryptology, Prentice Hall, 2005.

CSEDE 09: Pattern Recognition

UNIT-I:

Introduction: Examples; The nature of statistical pattern recognition; Three learning paradigms; The sub-problems of pattern recognition; The basic structure of a pattern recognition system; Comparing classifiers.

Bayes Decision Theory: General framework; Optimal decisions; Classification; Simple performance bounds.

UNIT-II:

Learning - Parametric Approaches: Basic statistical issues; Sources of classification error; Bias and variance; Three approaches to classification: density estimation, regression and discriminant analysis; Empirical error criteria; Optimization methods; Failure of MLE;

Parametric Discriminant Functions : Linear and quadratic discriminants; Shrinkage; Logistic classification; Generalized linear classifiers; Perceptrons; Maximum Margin; Error Correcting Codes;

UNIT-III:

Error Assessment: Sample error and true error; Error rate estimation; Confidence intervals; Resampling methods; Regularization; Model selection; Minimum description length; Comparing classifiers

Nonparametric Classification: Histograms rules; Nearest neighbor methods; Kernel approaches; Local polynomial fitting; Flexible metrics; Automatic kernels methods

UNIT-IV:

Feature Extraction: Optimal features; Optimal linear transformations; Linear and nonlinear principal components; Feature subset selection; Feature Extraction and classification stages, Unsupervised learning and clustering, Syntactic pattern recognition, Fuzzy set Theoretic approach to PR,

UNIT-V:

Margins and Kernel Based Algorithms: Advanced algorithms based on the notions of margins and kernels

Applications of PR: Speech and speaker recognition, Character recognition, Scene analysis.

REFERENCES

1. Theodoridis & Koutroumbas, Pattern Recognition, Academic Press

CSEDE 12: Soft Computing

UNIT-I

Introduction of soft computing, soft computing vs hard computing. Soft computing techniques. Computational Intelligence and applications, problem space and searching: Graph searching, different searching algorithms like breadth first search, depth first search techniques, heuristic searching Techniques like Best first Search, A* algorithm, AO* Algorithms.

Game Playing: Minimax search procedure, adding alpha-beta cutoffs, additional refinements, Iterative deepening, Statistical Reasoning: Probability and Bayes theorem, Certainty factors and Rules based systems, Bayesian Networks, Dempster Shafer theorem

UNIT-II:

Neural Network: Introduction, Biological neural network: Structure of a brain, Learning methodologies. Artificial Neural Network(ANN): Evolution of, Basic neuron modeling , Difference between ANN and human brain, characteristics, McCulloch-Pitts neuron models, Learning (Supervised & Unsupervised) and activation function, Architecture, Models, Hebbian learning , Single layer Perceptron, Perceptron learning, Windrow-Hoff/ Delta learning rule, winner take all , linear Separability, Multilayer Perceptron, Adaline, Madaline, different activation functions Back propagation network, derivation of EBPA, momentum, limitation, Applications of Neural network.

UNIT-III:

Unsupervised learning in Neural Network: Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Associative memory, hope field network and Bidirectional associative memory. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Introduction to Support Vector machine, architecture and algorithms, Introduction to Kohanan's Self organization map, architecture and algorithms

UNIT-IV

Fuzzy systems: Introduction, Need, classical sets (crisp sets) and operations on classical sets Interval Arithmetics ,Fuzzy set theory and operations, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic, fuzzification and defuzzification. Fuzzy associative memory. Fuzzy Logic Theory, Modeling & Control Systems

UNIT-V

Genetic algorithm : Introduction, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, including JSPP (Job shop scheduling problem), TSP (Travelling salesman problem), Applications of GA, Differences & similarities between GA & other traditional methods.

Evolutionary Computing: Concepts & Applications. Swarm Intelligence.

REFERENCES

1. S.N. Shivnandam, "Principle of soft computing", Wiley India.
2. David Poole, Alan Mackworth "Computational Intelligence: A logical Approach" Oxford.
3. Russell & Yuhui, "Computational Intelligence: Concepts to Implementations", Elsevier.
4. Eiben and Smith "Introduction to Evolutionary Computing" Springer
5. Janga Reddy Manne; "Swarm Intelligence and Evolutionary Computing"; Lap Lambert AcademicPublishing
6. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: SoftComputing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7, RiverEdge, World Scientific, 1997.

CSEDE 23: Natural Language Processing

UNIT I

What is Natural Language Processing,Ambiguity and uncertainty in language. The Turing test, Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena.

UNIT II

N-gram Language Models and Information Theory *n*-gram models. Entropy, relative entropy, cross entropy, mutual information, perplexity. Statistical estimation and smoothing for language models.Statistical Machine Translation (MT), Alignment Models.Statistical Alignment Models and Expectation Maximization (EM)EM and its use in statistical MT alignment models. Putting together a complete statistical MT systemDecoding and A* Search.

UNIT III

Information Extraction (IE) and Named Entity Recognition (NER).Information sources, rule-based methods, evaluation (recall, precision). Introduction to supervised machinelearning methods. Naïve Bayes (NB) classifiers for entity classification.Maximum Entropy Classifiers.

UNIT IV

Syntax and Parsing for Context-Free Grammars (CFGs) Parsing, treebanks, attachment ambiguities. Contextfreegrammars. Top-down and bottom-up parsing, empty constituents, left recursion, and repeated work Probabilistic CFGs.

UNIT V

Lexicalized Probabilistic Context-Free Grammars (LPCFGs)Lexicalization and lexicalized parsing. Modern Statistical ParsersSearch methods in parsing: Agenda-based chart, A*, and "best-first" parsing. Dependency parsing. Discriminativeparsing.

REFERENCES:

1. Daniel Jurafsky and James H. Martin. 2008. *Speech and Language Processing: An Introduction to Natural LanguageProcessing, Computational Linguistics and Speech Recognition*. Second Edition. Prentice Hall.

CSEDE 20: Quantum Computing

UNIT-I

Introduction to quantum mechanics; postulates of quantum mechanics; Qubit and quantum states: The Qubit, Vector Spaces, Single-Qubit Gates, multiple Qubit Gates, Controlled Gates, Gate Decomposition; Matrix and operators

UNIT-II

Density operators; ; The Density Operator for a Pure State, The Density Operator for a Mixed State ,Properties of a Density Operator, Characterizing Mixed States, Completely Mixed States, The Partial Trace and the Reduced Density Operator; quantum measurement theory: Distinguishing Quantum States and Measurement ,Projective Measurements, Measurements on Composite Systems, Generalized Measurements, Positive Operator-Valued Measures; Introduction to quantum automata

UNIT-III

Entanglement: quantum state entanglement ,Bell's Theorem, The Pauli Representation, Using Bell States For Density Operator Representation, Quantum gates and circuits: Single-Qubit Gates, The Z–Y Decomposition ,Basic Quantum Circuit Diagrams, Controlled Gates, Application of Entanglement in teleportation and supper dense coding., Distributed quantum communication

UNIT-IV

Quantum Algorithm: Hadamard Gates, The Phase Gate, Matrix Representation of Serial and Parallel Operations, Quantum Interference, Quantum Parallelism and Function Evaluation, Deutsch-Jozsa Algorithm, Quantum Fourier Transform, Phase Estimation, Shor's Algorithm ,Quantum Searching and Grover's Algorithm

UNIT-V

Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

REFERENCES

1. Quantum Computation and Quantum Information: M.A. Nielsen & Isaac L. Chuang
2. Quantum Computing Explained: David McMahon

Quantum Information: Preskill (Lecture Notes)

CSEDE 08: Mobile Computing

UNIT-I:

Wireless Transmission: Signal propagation, multiplexing, modulation, spread spectrum, cellular systems, **channel allocation, Wireless LAN ,** Bluetooth

Unit II:
Challenges in mobile computing: coping with uncertainties, resource poorness, banwidth, etc. **Mobility Management:** Cellular architecture, co-channel interference, frequency reuse, capacity increase by cell splitting. **Evolution of mobile system**: CDMA, FDMA, TDMA, GSM.

Unit III:
Handoff, types of handoffs; location management, HLR-VLR scheme, hierarchical scheme, predictive location management schemes. Mobile IP, **Mobile TCP**

Unit IV:
Publishing & Accessing Data in Air: Pull and push based data delivery models, data dissemination by broadcast, broadcast disks, directory service in air,
Support for mobility: File systems, World Wide web, Wireless application protocol, **Introduction to Mobile development frameworks and tools**, **Mobile operating systems,Mobile agents**

Unit V:
Mobile Ad- hoc Network(MANET): Layered architecture of MANET, Ad hoc network routing protocols, MAC and Transport layer issues of MANET,
Introduction to Wireless Sensor Network and Wireless Mesh Network

Textbooks:

1. J. Schiller, Mobile Communication, Pearson

2. Yu-.Kwong R. Kwok and Vincent K. N. Lau, Wireless Internet and Mobile Computing, John Wiley & Sons ,2007
3. Asoke K. Talukder and Roopa R. Yavagal,Mobile Computing: Technology, Applications, and Service Creation, McGraw-Hill,2006

4. W. Stallings, "Wireless Communications and Networks", Pearson Education, 2002.

References:
1. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”,Wiley,

2. Raj Kamal, Mobile Computing, Oxford University Press,2007

3.Y.B. Lin and I. Chlamtac, Wireless and Mobile network Architectures ,Wiley

4. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, Cambridge University press, 2004

CSEDE 11: VLSI Design and Algorithm

UNIT-I: Introduction to CMOS circuits: MOS Transistors, MOS transistor switches, CMOS Logic, The inverter, Combinational Logic, NOT Gate, NAND gate, NOR gate, Compound gates, Multiplexers, Memory- latches and registers.
Circuits and system representation: Behavioural representation, Structural representation, Physical representation.

UNIT-II: CMOS processing technology: Silicon semiconductor technology- An overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation and diffusion, The Silicon Gate Process-Basic CMOS technology, Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator, CMOS process enhancement-Interconnect, Circuit elements, 3-D CMOS.

UNIT-III: Layout design rule: Layer representations, CMOS n-well rules, Design rule of background scribe line, Layer assignment, SOI rule.
Switching characteristics: Analytic delay models, Empirical delay model, Gate delay.
Power dissipation: Static dissipation, Dynamic dissipation, Short-circuit dissipation, Total power dissipation.

UNIT-IV: CMOS design methods: Design strategies, Structural design strategies, Hierarchy, Regularity, Locality.
Programmable logic and its structure, Programmable interconnect, Programmable gate array, Concurrent logic, Full custom mask design, Gate array design.
Stick representation.

UNIT-V: Design Methods: Behavioural Synthesis, RTL synthesis, VLSI design cycle, Physical design cycle, Design styles, Partitioning, Floor-planning and Placement, Routing, Compaction.
Design tools: HDL design, Schematic, Layout design, Floor-planning, Chip composition.
Design Verification: Simulation, Timing verifier, Netlist comparisons.

REFERENCES:

1. Principles of CMOS VLS Design – A System Perspective by Neil H. E. West and K. Eshraghian; Addison Wesley Publishers.
2. Modern VLSI Design: System on silicon – W. Wolf; Addison Wesley Longman Publishers.
3. Basic VLSI Design – D. A. Pucknell & K. Eshraghian; Prentice Hall of India.
4. Digital Integrated Circuits: A Design Perspective – J. M. Rabaey; Prentice Hall of India.
5. Multi-Layer Channel Routing: Complexity and Algorithms – R. K. Pal; Narosa Publishing House, New Delhi.
6. Algorithms for VLSI Physical Design Automation – N. A. Sherwani; Kluwer Academic Publishers.
7. VLSI Physical Design Automation: Theory and Practice – S. M. Sait and H. Youssef; World Scientific Publishing Co.
8. Introduction to nMOS and CMOS VLSI Systems Design – A. Mukherjee; Prentice Hall.

CSEDE 14: Cloud Computing

UNIT-I

Introduction to Cloud Computing, The Evolution of Cloud Computing, Hardware Evolution, Internet Software Evolution, Server Virtualization, Web Services Deliver from the Cloud, Communication-as-a-Service, Infrastructure-as-a-Service, Monitoring-as-a-Service, Platform-as-a-Service, Software-as-a-Service, Building Cloud Network

UNIT-II

Federation in the Cloud, Presence in the Cloud, Privacy and its Relation to Cloud-Based Information Systems, Security in the Cloud, Common Standards in the Cloud, End-User Access to the Cloud Computing

UNIT –III

Introduction, Advancing towards a Utility Model, Evolving IT infrastructure, Evolving Software Applications, Continuum of Utilities, Standards and Working Groups, Standards Bodies and Working Groups, Service Oriented Architecture, Business Process Execution Language, Interoperability Standards for Data Center Management, Utility Computing Technology, Virtualization, Hyper Threading, Blade Servers, Automated Provisioning, Policy Based Automation, Application Management, Evaluating Utility Management Technology, Virtual Test and development Environment, Data Center Challenges and Solutions, Automating the Data Center

UNIT-IV

Software Utility Application Architecture, Characteristics of an SaaS, Software Utility Applications, Cost Versus Value, Software Application Services Framework, Common Enablers, Conceptual view to Reality, Business Profits, - Implementing Database Systems for Multitenant Architecture

UNIT-V

Other Design Considerations - Design of a Web Services Metering Interface – Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

REFERENCES

1. John W. Rittinghouse and james F. Ransome, “Cloud Computing Implementation, Management and Security”, 2010, CRC Press, Taylor & Francis Group, Boca Raton London New York. [Unit -11 and Unit II]
2. Alfredo Mendoza, “Utility Computing Technologies, Standards, and Strategies”, Artech House INC, 2007. [Unit -11I to Unit V]
3. Bunker and Darren Thomson, “Delivering Utility Computing”, 2006, John Wiley & Sons Ltd.
4. George Reese, “Cloud Application Architectures”, O’reilly Publications, 2009.

OPEN ELECTIVES (CSE 0E)

CSEOE 01: Core Java

UNIT-I: INTRODUCTION TO OOP & JAVA

Need For OOP Paradigm, Features Of OOP,History Of Java, Java Buzzwords, Java Virtual Machine, Byte Codes, Keywords, Data Types, Variables, Scope And Life Time Of Variables,Operators, Expressions, Control Statements, Type Conversion And Casting, Simple Java Program, IDEs

UNIT-II: CLASS, OBJECTS & METHODS

Concepts Of Classes, Objects Instantiation, Constructors, Methods, Parameter Passing, Arrays, Access Control, This Keyword and Garbage Collection, Overloading Methods, Recursion, Nested AndInner Class, Exploring String Class, Wrapper Class.

UNIT-III: INHERITANCE, ABSTRACTION, PACKAGES & INTERFACES

Extending Classes, Member Access Rules, Super Keyword, Using Final, Polymorphism- Method Overriding, Abstract Classes, the Object Classes.

Defining, Creating & Accessing a Package, Importing Packages, Standard Java Package Hierarchy, Differences between Classes & Interfaces, Defining an Interface,Implementing Interface, Applying Interfaces, Variables in Interface & Extending Interfaces, ExploringPackages

UNIT-IV: EXCEPTIONS, IO STREAMS & MULTITHREADING

Concepts Of Exception Handling, Benefits Of Exception Handling, Exception Hierarchy, Usage Of Try, Catch, Throw, Throws And Finally, Built In Exceptions, Creating Own Exceptions. Exploring Java Streams

Differences Between Multi-Threading And Multitasking, Thread Life Cycle, CreatingThreads, Thread Priorities, Synchronizing Threads, Inter Thread Communication, Thread Groups, Daemon Threads, Enumerations, Auto-boxing.

UNIT-V: GUI, EVENT HANDLING AND DATABASE CONNECTIVITY

Exploring AWT And Swing, User Interface Components- Labels, Button, Canvas, Scrollbars, TextComponents, Check Box, Check Box Groups, Choices, Lists Panels , ScrollPane, Dialogs, Menu Bar, Layout Manager - Border, Grid, Flow & Card Events, Event Sources, Event Classes, Event Listeners, Brief Overview of JavaFXComponents &Event Handlers.

JDBC architecture, JDBC Drivers, Establishing connectivity and working with connection interface,Working with statements,Query Execution,Updatable Result Sets, Row Sets.

TEXT BOOKS:

1. Herbert Schildt ,"Java; The Complete Reference" , 7th edition, , TMH.2.
2. Cay.S.Horstmann and GaryCornell,"Core Java 2,Vol. 1, Fundamentals", 7th Edition, Pearson Education.

References:

- Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
- Big Java, Cay Horstmann 2nd edition, Wiley India Edition
- Core Java, Dietel and Dietel
  Online Oracle Resources