Semester-I

TIT 1101 Computability and Complexity Theory

Module-I +II

Basic background on automata and languages, Types of automata and languages, Turing machines, k-tape Turing machines, non-deterministic Turing machines, Universal Turing machine, Halting problem. Recursive enumerable languages, Recursive languages, Decidable and recognizable language, Turing-decidable languages, Turing-recognizable languages, Context Sensitive Language and Chomosky Hierarchy.

Module-III+IV

Primitive recursive function, partial recursive function, Recursive and recursive enumeration sets, Programming systems, Unsolvable problems, a non-recursive language and an unsolvable problem, Reducing one problem to another problem, Rice Theorem, More unsolvable problems, PCP.

Module-V+VI

Measuring complexity- Big Oh, small oh and other notations, Analyzing algorithms, Time and space complexity of a Turing machine, Complexity analysis of multi-tape TM Complexity classes: P, NP, NP-C, NP-Complete problem, Additional NP-complete problems- clique, vertex cover, Hamiltonian cycle, coloring problem, graph isomorphism, Reduction from NP-C problem to another problem.

Module-VII

Tractable and Intractable problems.

Text Books

1. Lewis H.R., Papadimitriou C.H.- Elements of the Theory of Computation:, PHI Publ. , 2nd edition, New Delhi

2. John Martin. *Introduction to Languages and the Theory of Computation, 3rd ed.* McGraw Hill, New York, NY, 2003.

TIT 1003 ADVANCED DATABASE

Module -I

Review of basic concepts, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL.

Module -II

Concurrency Control Techniques, Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques, Validation (Optimistic) Concurrency Control Techniques, Granularity of Data Items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes, Other Concurrency Control Issues.

Module -III

Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm, Recovery in Multidatabase Systems, Database Backup and Recovery from Catastrophic Failures.

Module -IV

Overview of Object-Oriented ConceptsObject Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods and Persistence, Type and Class Hierarchies and Inheritance, Complex Objects, Overview of the Object Model of ODMG, The Object Definition Language ODL, The Object Query Language, OQL, Overview of the c++ Language Binding, Object Database Conceptual Design.

Module -V

Overview of SQL and Its Object-Relational Features Evolution and Current Trends of Database Technology The Informix Universal Server, Implementation and Related Issues for Extended Type Systems The Nested Relational Model, Active Database Concepts and Triggers Temporal Database Concepts Multimedia Databases, Introduction to Deductive Databases.

Module -VI

Distributed Databases and Client-Server Architectures, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Types of Distributed Database Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases, An Overview of 3-Tier Client-Server Architecture.

Module -VII

Data Modeling for Data Warehouses Characteristics of Data Warehouses Introduction, Definitions, and TerminologyBuilding a Data WarehouseTypical Functionality of a Data WarehouseData Warehouse Versus ViewsProblems and Open Issues in Data Warehouses, Mobile Databases Multimedia Databases Geographic Information Systems Genome Data Management

TEXT BOOK:

1. Elmasri R., Navathe S.B., Fundamentals of Database Systems, 5th Edn., Pearson Education/Addison Wesley, 2007.

REFERENCE BOOKS:

1. C.J. Date , An introduction to Database Systems, 7th Edn., Pearson Education, New Delhi, 2004.
2. H. Korth et al. ,Database Management System Concepts, 3rd Ed., TMH, New Delhi, 2002.
3. B.Desai, Database Management Systems, Galgotia Publications, New Delhi, 1998.

TIT 1005 COMUTATIONAL INTELLIGENCE

Module -I

Introduction: Computational Intelligence paradigms, artificial neural network, evolutionary computation swarm intelligence, artificial immune system, fuzzy systems.

Module –II

Artificial Neural Networks: Artificial neuron, supervised neural network, supervised learning rules, functioning of hidden Modules, ensemble neural networks. Unsupervised learning neural networks: Hebbian learning rule, self-organizing feature maps.

Module -III

Radial Basis Function Network: Learning Vector Quantizer, Radial basis function network, training algorithms.

Reinforcement Learning: Model free reinforcement learning model, neural networks and reinforced learning.

Module -IV and V

Evolutionary Computation: Generic evolutionary algorithm, chromosome representation, initial population, fitness function, selection, reproduction operators, stopping criteria, evolutionary computation versus classical optimization, genetic algorithms and its variants,building blocks of genetic programming, basic evolutionary programming.

Module -VI

Computational Swarm Intelligence: Basic Particle swarm intelligence and its variants, PSO parameters, single solution PSO, multiobjective optimization using PSO, introduction to ant colony optimization, foraging behavior of ants.

Module -VII

Artificial Immune System: Natural immune system, artificial immune models, application of AIS.

TEXT BOOK:

1. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley.

REFERENCE BOOK:

1. AmitKonar, Computational Intelligence: Principles, Techniques and Applications, Springer.

Semester-II

TIT 2001 INFORMATION THEORY

Module -I

Information, Entropy, Relationship between entropy and information, Information measures of discrete and continuous variables, Joint entropy, Conditional entropy, Relative Entropy and Mutual Information, Chain rules of entropy, The log sum inequality and its application, Data processing inequality, Kraft's inequality

Module -II

Kolmogorov complexity: definitions and examples, Models of computation, Kolmogorov complexity and entropy, Kolmogorov complexity of integers, Algorithmically random and incompressible sequences, Universal probability

Module - III & IV

Classification of codes, Prefix codes, Huffman Codes, Lempel-ziev (LZ) codes, Optimality of these codes, Information content of these codes, Source coding theorem, Shannon-Fano coding Channel models, Channel capacity, Symmetric channels, Properties of channel capacity, Channel coding theorem, Information Capacity Theorem, Discrete memoryless channels – BSC, Shannon limit

Module -V

Error Control Coding: Introduction, Forward and Backward error Correction, Hamming Weight and Hamming Distance, Linear Block Codes, Encoding and decoding of Linear Block-codes, Parity Check Matrix, Syndrome Decoding, Hamming Codes

Module -VI

Cyclic Codes: Introduction, Method for generating Cyclic Codes, Matrix description of Cyclic codes, Burst error correction, Cyclic redundancy check (CRC) codes, Circuit implementation of cyclic codes

Module -VII

BCH: Primitive elements, Minimal polynomials, Generator polynomials in terms of minimal polynomials, Examples of BCH codes

Convolutional Codes: Introduction, Polynomial description of Convolutional Codes, Generating function, Matrix description of Convolutional Codes, Viterbi Decoding of Convolutional codes.

TEXT BOOKS:

1. Ranjan Bose, Information Theory, Coding and Cryptography, TMH, New Delhi, India, 2007.
2. Cover Thomas and Joy Thomas, Elements of Information Theory, Wiley India Pvt. Ltd., 2006.

TIT 2003 COMMUNICATION THEORY

Module – I

Introduction: The Communication process, Sources of Information, Communication Channels, Baseband and Passband Signals, Representation of Signals and Systems, Probabilistic Considerations, The Modulation Process, Primary Communication Resources, Information Theory and Coding, Analog Versus Digital Communications, Networks.

Module -II

Representation of Signals and Systems: The Fourier Transform, Properties of the Fourier Transform, Rayleigh's Energy Theorem, The Inverse Relationship Between Time and Frequency, Dirac Delta Function, Fourier Transforms of Periodic Signals, Transmission of Signals Through Linear Systems, Filters, Hilbert Transform, Pre-Envelop, Canonical Representations of Band-Pass Signals, Band-Pass Systems, Phase and Group Delay, Numerical Computation of the Fourier Transform, Summary.

Module -III

Continuous-Wave Modulation: Introduction, Amplitude Modulation, Virtues, Limitations, and Modifications of Amplitude Modulation, Double Sideband-Suppressed Carrier Modulation, Filtering of Sidebands, Vestigial Sideband Modulation, Single Sideband Modulation, Frequency Translation, Frequency-Division Multiplexing, Angle Modulation, Frequency Modulation, Phase-Locked Loop, Nonlinear Effects in FM Systems, The Super heterodyne Receiver, Summary and Discussion.

Module-IV

Noise in CW Modulation Systems: Introduction, Receiver Model, Noise in DSB-SC Receivers, Noise in SSB Receivers, Noise in AM Receivers, Noise in FM Receivers, Pre-emphasis and De-emphasis in FM, Summary and Discussion.

Module -V

Pulse Modulation: Introduction, The Sampling Process, Pulse-Amplitude Modulation, Time-Division Multiplexing, Pulse-Position Modulation, Bandwidth-Noise Trade-off, The Quantization Process, Pulse-Code Modulation, Noise Considerations in PCM Systems, Virtues, Limitations and Modifications of PCM, Delta Modulation, Differential Pulse-Code Modulation, Coding Speech at Low Bit Rates, Summary and Discussion.

Module -VI

Baseband Pulse Transmission: Introduction, Matched Filter, Error Rate due to Noise, Intersymbol Interference, Nyquist's Criterion for Distortion less Baseband Binary Transmission, Correlative-Level Coding, Baseband M-ary PAM Transmission, Tapped-Delay-Line Equalization, Adaptive Equalization, Eye Pattern, Summary and Discussion.

Module -VII

Digital Passband Transmission: Introduction, Passband Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of Bank of Correlators to Noisy Input, Coherent Detection of Signals in Noise, Probability of Error, Correlation Receiver, Detection of Signals with Unknown Phase, Hierarchy of Digital Modulation Techniques, Coherent Binary PSK, Coherent Binary FSK, Coherent Quadriphase-Shift Keying, Differential Phase-Shift Keying, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency, Synchronization, Summary and Discussion.

TEXT BOOK:

1. Simon Haykin ,Communication Systems, 3rd Edition, 2008.

REFERENCE BOOKS:

1. Signals, Systems, and Communication by B.P.Lathi
2. Communication Theory by Dr. J.S.Chitode, 2010.

TIT 2005 DATA COMPRESSION AND DATA HIDING

Module-I
Basic techniques: Run length encoding, RLE text compression, RLE image compression
Statistical methods: Shanon Fano coding, Huffman coding, Adaptive Huffman coding

Module -II
Dictionary methods: String compression, LZW, Zip, Gzip, CRC
Image compression: Approaches, image transform, JPEG, Progressive image compression

Module -III
Wavelet methods: Fourier transform, Fourier image compression, Haar transform
Video compression: Analog video, Digital video, video compression, MPEG

Module-IV
Audio compression: Sound, Digital audio, μ law and A- law companding , human auditory system, ADPCM data compression, MLP Audio, Speech compression

Module -V
Introduction: What is Data Hiding? Forms of Data Hiding Properties of Steganographic Communications , The Steganographic Channel
Frameworks for Data Hiding : Signal Processing Framework

Module -VI
Communication with Side Information and Data Hiding : Costa's Framework ,A Framework Based on Channel Adaptive Encoding and Channel Independent Decoding , On the Duality of Communications and Data Hiding Frameworks

Module -VII
Type I (Linear) Data Hiding : Linear Data Hiding in Transform Domain , Problem Statement 4.3 Capacity of Additive Noise Channels 4.4 Modeling Channel Noise ,Visual Threshold , Channel Capacity vs. Choice of Transform
Type II and Type III (Nonlinear) Data Hiding Methods , Type II Embedding and Detection ,Type III Embedding and Detection Methods

TEXT BOOKS:
1. David Saloman, Data Compression, 4th edition, Springer
2. Husrev Sencar, Ali Akansu, Data Hiding Fundamentals and applications Content security in digital multimedia, Elsevier Academic Press

REFERENCE BOOKS:
1. Nelson, The Data Compression Book, BPB.
2. Atul Kahate , Cryptography & Network Security, TMH.
3. B. Forouzan , Cryptography and Network Security, Tata McGraw-Hill.

Semester III

TIT 3050 Thesis

Semester IV

TIT 3050 Thesis

List of Electives

Elective-I

TIT 1011 STOCHASTIC PROCESS AND SIMULATION

Module -I

Probability Theory: Axiomatic construction of probability spaces, random variables and vectors, probability distributions, functions of random variables; mathematical expectations, transforms and generating functions, modes of convergence of sequences of random variables, laws of large numbers, central limit theorem.

Introduction to Stochastic Processes (SPs): Definition and examples of SPs, classification of random processes according to state space and parameter space, types of SPs, elementary problems.

Module -II

Discrete-time Markov Chains (MCs): Definition and examples of MCs, transition probability matrix, Chapman-Kolmogorov equations; calculation of n-step transition probabilities, limiting probabilities, classification of states, ergodicity, stationary distribution, transient MC; random walk and gambler's ruin problem, applications.

Continuous-time Markov Chains (MCs): Kolmogorov- Feller differential equations, infinitesimal generator, Poisson process, birth-death process, Applications to queuing theory, inventory analysis, communication networks, finance and biology.

Module -III

Introduction to Simulation and Modeling: System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation. Examples: Simulation of Queuing systems, Other examples of simulation. General Principles: Concepts of discrete event simulation, List processing. Simulation Software: History of simulation software, selection of software.

Module -IV

Statistical Models: Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution. Queuing Models: Characteristics of Queuing systems, Queuing notations, Long run measures of performance of Queuing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues.

Module -V

Input Modeling and Verification and Validation of Simulation Model Input Modeling: Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models. Verification and Validation of Simulation Model: Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.

Module -VI

Output Analysis for a single model,Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state simulation.

Module -VII

Comparison and Evaluation of Alternative System Design: Comparison of two system design, Comparison of several system design, Meta modeling, Optimization via simulation.

TEXT BOOKS:

1. S.M. Ross, Stochastic Processes, 2nd Edition, Wiley, 1996 (WSE Edition).
2. Jerry Banks, John Carson, Barry Nelson, David Nicol, Discrete Event System Simulation, 5th Edition.

REFERENCE BOOKS:

1. J. Medhi, Stochastic Processes, 3rd Edition, New Age International, 2009.
2. Averill Law, W. David Kelton, Simulation Modeling and Analysis, McGRAW HILL.
3. Geffery Gordon, System Simulation, PHI.

TIT 1013 COMPUTER ALGORITHMS

Module -I

Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures: stack, queue, Dequeue, Linked Lists, etc.

Module-II

Algorithm Analysis,Mathematical Induction,ummation Techniques,Time Space Trade-off , Asymptotic Notation , Properties of big-Oh notation, Recurrence equations – Solving recurrence equations , Mathematical Analysis of Non-recursive and Recursive Algorithms,Master Theorem and its applications

Module –III and IV

Brute Force approach: Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum, Binary tree traversals and related properties, Merge Sort, Strassen's Matrix Multiplication, Quicksort

Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting,

Transform and Conquer: Balanced Search Trees, Heaps and Heapsort, Problem Reduction

Module -V

Greedy Algorithms: General Method, Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees

Module -VI

Dynamic Programming: General Method , Multistage Graphs , All-Pair shortest paths,Optimal binary search trees,0/1 Knapsack ,Travelling salesperson problem

Module -VII

Backtracking: General Method , 8 Queens problem ,Sum of subsets , graph colouring,Hamiltonian problem, knapsack problem

Branch and Bound: General Methods (FIFO & LC),0/1Knapsack problem,

Introduction to NP-Hard and NP-Completeness, KMP string matching algorithm,Maximal Network Flow problem,Bipartite graphs, Hashing

TEXT BOOK:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L.Rivest,Clifford Stein, Introduction to Algorithms,2nd Edition, PHI, 2006.

REFERENCE BOOKS:

1. Horowitz E., Sahni S., Rajasekaran S.,Computer Algorithms,Galgotia Publications, 2001.
2. Alfred V. Aho,John E.Hopcroft and Jeffrey D.Ullman,The Design and Analysis of Computer Algorithms, Pearson Education, 1999.

TIT 1015 CRYPTOGRAPHY

Module –I

Overview of Cryptography and its Applications: Secure Communications, Cryptographic Applications.

Module –II

Classical Cryptosystems: Shift Ciphers, Affine Ciphers, The Vigenere Cipher, Substitution Ciphers, Sherlock Holmes, The Playfair and ADFGX Ciphers, Block Ciphers, Binary numbers and ASCII, One-Time Pads, Pseudo-Random Bit Generation, LFSR Sequences, Enigma.

Module –III

The Data Encryption Standard: Introduction, A Simplified DES-Type Algorithm, Differential Cryptanalysis, DES, Modes of Operation, Breaking DES, Meet-in-the-Middle Attacks, Password Security.

Module –IV

The RSA Algorithm: The RSA Algorithm, Attacks on RSA, Primality Testing, Factoring, The RSA Challenge, An Application to Treaty Verification, The Public Key Concept.

Module –V

Discrete Logarithms: Discrete Logarithms, Computing Discrete Logs, Bit Commitment, Diffie-Hellman Key Exchange, The ElGamal Public Key Cryptosystem.

Module –VI

Hash Functions: Hash Functions, A Simple Hash Example, The Secure Hash Algorithms, Birthday Attacks, Multicollisions, The Random Oracle Model, Using Hash Functions to Encrypt.

Module –VII

Digital Signatures: RSA Signatures, The ElGamal Signatures Scheme, Hashing and Signing, Birthday Attacks on Signatures, The Digital Signature Algorithm.

TEXT BOOK:

1. Wade Traple , Lawrence C. Washington-Introduction to Cryptography with Coding Theory, Pearson Education.

REFERENCE BOOKS:

1. Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, McGraw Hill, New Delhi.
2. William Stallings- Cryptography & Network Security Principles and Practice, Pearson Education.

TIT 1017 MOBILE AND WIRELESS NETWORK

Module -I

Introduction: Fundamentals of Wireless Communication - Transmission fundamentals – Wireless Communication Technology - Antennas and Propagation, Spread Spectrum, Modulation Techniques, Coding and Error Control.

Module -II

Wireless Networking, Wireless LANS & PANS: Wireless Networking – Satellite Communication, Cellular Wireless Networks, Mobile IP and Wireless Access Protocol, Wireless LANs -Wireless LAN Technology, IEEE 802.11 Wireless LAN Standards, Bluetooth, HIPERLAN Standard, HomeRF.

Module -III

Ad-Hoc Wireless Networks & Security : Introduction - Issues in Ad Hoc Wireless Networks - Classifications of MAC Protocols -Classifications of Routing Protocols - Classifications of Transport Layer Protocols -Classification of Energy Management Schemes – Wired Equivalent Privacy(WEP) – The Extensible Authentication Protocol - Security in Ad Hoc Wireless Networks.

Module -IV

Wireless Sensor Networks: Introduction - Sensor Network Architecture - Data Dissemination - Data Gathering -MAC Protocols for Sensor Networks - Location Discovery - Quality of a Sensor Network Evolving Standards - Other Issues.

Module -V

Recent Advances in Wireless Networks: Ultra-Wide-Band Radio Communication - Wireless Fidelity Systems - Optical Wireless Networks - The Multimode 802.11 -IEEE 802.11a/b/g - The Meghadoot Architecture - Next-Generation Hybrid Wireless Architectures.

Module -VI

Cellular Mobile Wireless Networks: Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Cochannel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

Module -VII

Evolution of Modern Mobile Wireless Communication System: First Generation Wireless Networks, Second Generation (2G) Wireless Cellular Networks, Major 2G standards, 2.5G Wireless Networks, Third Generation 3G Wireless Networks, Wireless Local Area Networks (WLANs), Cellular –WLAN Integration, All-IP Network: Vision for 4G.

TEXT BOOKS:

1. William Stallings, Wireless Communications and Networking, Pearson Education, 2nd Edition, 2005.
2. Theodore S. Rappaport, Wireless Communication: Principles and Practice, 2nd Edition. Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Siva Ram Murthy C, Manoj B.S, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall, 2004.
2. William C.Y.Lec, Mobile Cellular Telecommunication, Analog and Digital Systems, McGraw Hill Inc.
3. Kaveh Pahlavan and Prashant Krishnamurthy, Principles of Wireless Networks, 1st Edn., Pearson Education Asia, 2002.
4. Rappaport T.S, Wireless Communications: Principles and Practice, Prentice Hall., 2nd Edition.

TIT 1019 MOBILE COMPUTING

Module -I

Introduction: Mobility of bits and bytes, wireless the beginning, mobile computing, dialogue control, Networks, middleware and gateways, application and services, developing mobile computing applications, security in mobile computing, standard bodies. Mobile Computing Architecture: architecture for mobile computing, three tier architecture, design consideration, mobile computing through internet, making existing applications –mobile enabled.

Module -II

Mobile Computing through Telephony: evolution of telephony, multiple access procedures, mobile computing through telephone, developing an IVR application, voice XML, telephone application programming interface. Emerging Technologies: introduction, Bluetooth, radio frequency identification, wireless broadband, mobile IP, IPV6, java card.

Module -III

Global System for Mobile Communications GSM: introduction, GSM architecture , call routing in GSM, PLMN interface, GSM address and identifiers, network aspect in GSM, GSM frequency allocation, authenticity and security. Short Message Service SMS : Mobile computing over SMS, Short message services(SMS) , value added services through SMS, Accessing the SMS bearer.

Module -IV

General Packet Radio Service GPRS:GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, applications for GPRS, limitations for GPRS, billing and charging in GPRS. Wireless Application Protocol WAP: introduction , WAP, MMS, GPRS applications.
CDMA and 3G: Introduction, spread spectrum technology,ls-95,CDMA vs GSM, wireless data, 3rd generation network, applications on 3G.

Module -V

Client Programming: introduction, moving beyond the desktop, a peak under the hood: hardware overview, mobile phone, PDA, design constraints in application for handheld devices. Programming for the Palm OS,Wireless Devices with Symbian OS,J2ME,Wireless Devices with Windows CE.

Module -VI

Voice Over Internet Protocol and Convergence: VoIP, H 323 framework for VoIP 564, SIP, comparision between H.323 and SIP 570, Real time protocol, convergence technologies, call routing, voice over IP applications, IP multimedia subsystem, Mobile VoIP.

Module -VII

Security Issues in Mobile Computing: Introduction, information security, security techniques and algorithm, security protocols, public key infrastructure, trust, security models, security framework for mobile environment.

TEXT BOOK:

1. Ashok Talukedar, Hasan Ahmed, Roopa R Yavagal, Mobile Computing Technolgy , Applications and Service Creation,Tata McGraw - Hill Education ,2010.

REFERENCE BOOKS:

1. Jochen H. Schiller, Mobile Communications, 2nd Edition,Addison wesley.
2. Rajkamal, Mobile Computing,2nd Edn., Oxford University Press
3. Reza Behravanfar, Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, ISBN: 0521817331, Cambridge University Press, October 2004.
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, Fundamentals of Mobile and Pervasive Computing, ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, Principles of Mobile Computing, 2nd Edn., Springer, 2003.

TIT 1021 CLUSTER AND GRID COMPUTING

Module-I&II

Overview of Cluster Computing: The Role of Clusters, Definition and Taxonomy, Distributed Computing, Limitations

Cluster Planning: Architecture and Cluster Software, Design Decisions, Network Hardware, Network Software, Protocols, Distributed File Systems, Virtualization technologies

Module -III Introduction-Parallel and Distributed Computing- Cluster Computing-Grid Computing: Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

Module -IV
Grid Monitoring : Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE
– JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

Module- V
Grid Security And Resource Management: Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid
Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

Module Vi Data Management And Grid Portals: Data Management-Categories and Origins of Structured Data-Data Management
Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

Module VII
Grid Middleware: List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.

TEXT BOOKS
1. High Performance Cluster Computing (Vol. 1-2), R. Buyya (ed.), ISBN 0-13-013784-7, Prentice Hall, 1999.
2. Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005.
REFERENCE BOOKS
1. Ian Foster & Carl Kesselman, The Grid 2 – Blueprint for a New Computing Infrastructure , Morgan Kaufman – 2004.
2. Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson Education 2004.
3. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, “Grid Computing: Making the Global Infrastructure a reality”, John Wiley and sons, 2000

TIT 1023 DISTRIBUTED COMPUTING

Module -I

Distributed Computing- An Introduction: Definitions, The History of Distributed Computing, Different Forms of Computing, The Strengths and Weaknesses of Distributed Computing, Basics of Operating Systems, Network Basics, Software Engineering Basics.

Module -II

Interprocess Communications: An Archetypal IPC Program Interface, Event Synchronization, Timeouts and Threading, Deadlocks and Timeouts, Data Representation, Data Encoding, Text Based Protocols, Request-Response Protocols, Event Diagram and Sequence Diagram, Connection-Oriented versus Connectionless IPC.

Module -III

Distributed Computing Paradigms: Paradigms and Abstraction, Paradigms for Distributed Applications, Trade-offs.

The Socket API: Background, The Socket Metaphor in IPC, The Datagram Socket API, The Stream- Mode Socket API, Sockets with Nonblocking I/O Operations, Secure Socket API.

Module -IV

The Client-Server Paradigm: Background, Client-Server Paradigm Issues, Software Engineering for a Network Service, Connection-Oriented and Connectionless Servers, Iterative Server and Concurrent Server, Stateful Servers.

Module -V

Group Communication: Uni-casting versus Multicasting, An Archetypal Multicast API, Connectionless versus Connection-Oriented Multicast, Reliable Multicasting versus Unreliable Multicasting, The Java Basic Multicast API, Reliable Multicast API.

Module -VI

Distributed Objects: Message Passing versus Distributed Objects, An Archetypal Distributed Object Architecture, Distributed Object Systems, Remote Procedure Calls, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, A Simple RMI Application, Steps for Building an RMI Application, Testing and Debugging, Comparison of RMI and Socket APIs.

Module -VII

Advanced RMI: Client Callback, Stub-downloading, RMI Security Manager
Advanced Distributed Computing Paradigms, Message Queue System, Mobile Agent

TEXT BOOK:

1. M.L.Liu, Distributed Computing, Principles and Applications, 1st Indian Reprint, Pearson Education, 2004.

REFERENCE BOOK:

1. SModulea Mahajan and Seema Shah, Distributed Computing, Oxford Unv. Press, New Delhi, 2010.

TIT 1025 SPEECH PROCESSING

Module -I

Speech Production: Introduction, Speech production process, Representing speech in time and frequency domains, Speech sounds and features, Approaches to automatic speech recognition by machine.

Module –II

Time Domain Methods for Speech Processing: Time domain parameters of speech, Method for extracting the parameters, Zero crossing, Auto correlation function, Pitch period estimation, Magnitude difference function.

Module -III

Liner Predictive Coding of Speech: The liner predictive coding Model, Liner predictive coding analysis equations, The autocorrelation method, The covariance method, Liner predictive coding processor for speech recognition.

Module -IV

Classification Techniques: Elements of vector quantization implementation, The VQ training set, The similarity or distance measure, Clustering the training vectors, Vector classification procedure, Comparison of vector and scalar quantizers.

Module -V

Hidden Markov Models: Introduction, Discrete-time markov process, Extensions to HMM, Basic problems for HMM, Types of HMMs, Continuous observation densities in HMM, Auto regressive HMMs, Variants on HMM structures, Comparisons of HMMs.

Module -VI

Speech Coding Techniques: Structure of speech coding systems, Desirable properties of a speech coder, Classification of speech coders, Regular- Pulse Excitation Coders (RPEC), Code Book Excited Linear Prediction (CELP).

Module -VII

Speech Quality Assessment: Introduction, The scope of quality and measuring conditions, objective quality measurements for coders, subjective quality measures, objective quality measures, objective versus subjective measures.

TEXT BOOKS:

1. Lawrence Rabiner, Biing ,Hwang Juang, Fundamentals of Speech Recognition Pearson Education India 2008.
2. Wai C. Chu, Speech Coding Algorithms, Foundation and Evolution of Standardize Coders, John Wiley & Sons, Inc., Publication, Ist Edition 2003.

REFERENCE BOOK:

1. L.R. Rabiner and R.E Schafer, Digital processing of speech signals, Pearson Education Eduction India, Ist Edition.

TIT 1027 DATA MINING & WAREHOUSING

Module -I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Module -II

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

Module -III

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Module -IV

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, 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 a Predictor, Ensemble Methods

Module -V

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

Module -VI

Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multirelational Data Mining:

Module -VII

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web. Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

TEXT BOOKS:

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2006.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education.

REFERENCE BOOKS:

1. Arun K Pujari, Data Mining Techniques, 2nd edition, Universities Press.
2. Sam Aanhory & Dennis Murray, Data Warehousing in the Real World, Pearson Edn. Asia.
3. K.P.Soman,S.Diwakar,V.Ajay, Insight into Data Mining, PHI, 2008.
4. Paulraj Ponnaiah, Data Warehousing Fundamentals, Wiley Student Edition.

TIT 1029 HUMAN COMPUTER INTERACTION

Module -I

Foundations: Introduction, Historical evolution of the field, Input-Output channels, Human memory, Thinking, Emotion, Psychology and design of interactive systems, Text entry devices, Display Devices,Devices for virtual reality and 3D interactions, models of interaction, ergonomics, interaction styles, HCI paradigms.

Module - II and III

Design Process: Interaction design basics, HCI in the software process, The software life cycle, Usability engineering, Iterative design and prototyping, Design rules: Principles to support usability, Standards and guidelines, golden rules and heuristics, HCI patterns.

Module -IV

Design Process: Implementation support, evaluation techniques, universal design, user support.

Module-V

Models and Theories: Cognitive models, Socio organizational issues and stake holder requirements.

Module -VI

Communication and Collaboration Models: Face- to-face communication, conversation, text based communication, group working.

Module -VII

Groupware systems, ubiquitous computing and augmented realities, hypertext, multimedia and world wide web.

TEXT BOOK:

Human Computer Interaction by Alan Dix, Janet Finley, Gregory Abowd, Russell Beale, Pearson India.

TIT 1031 DIGITAL SIGNAL PROCESSING

Module -I

Introduction to Digital Signal Processing: Discrete-Time Signals, Shanon's sampling theorem, Difference equation description, characteristics of digital filters and time domain analysis, properties of discrete time system (linearity, time-variance, convolution), BIBO stability, Z-transformation and their application in solving difference equations, Relationship between Laplace and Z-transforms

Module -II

Frequency domain analysis: Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT), Periodic convolution, Direct evaluation of DFT, FFT algorithms- decimation in time and frequency, Relationship between Fourier and Z-transforms.

Module -III

Fast Fourier Transforms: Fast Fourier transforms (FFT) - Radix-2 decimation-in-time and decimation-in-frequency FPT Algorithms, Inverse FFT and FFT with general Radix-N

Module - IV

Realization of Digital Filters: Applications of Z - transforms, solution of difference equations of digital filters, System function. Stability criterion. Frequency response of stable systems, Realization of digital filters - Direct, Canonic, Cascade and Parallel forms

Module -V

IIR Digital Filters: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters. Step and Impulse invariant techniques. Bilinear transformation method, Spectral transformations.

Module -VI

FIR Digital Filters: Structures of FIR – Linear phase FIR filter – Filter design using windowing techniques, Frequency sampling techniques – Finite word length effects in digital Filters.

Module -VII

Applications: Multirate signal processing – Speech compression – Adaptive filter – Musical sound processing – Image enhancement.

TEXT BOOK:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications: Pearson Education / PHI. 2007.

REFERANCE BOOKS:

1. A. V. Oppenheim and R.W. Schaffer, Discrete Time Signal Processing-. PHI, 2009
2. Loney Ludeman , Fundamentals of Digital Signal Processing, John Wiley, 2009
3. Li Tan, Digital Signal Processing - Fundamentals and Applications, Elsevier. 2008
4. Robert J. Schilling. Sandra L, Harris, Thomson. Fundamentals of Digital Signal Processing using Matlab - 2007
5. S.Salivahanan. A.Vallavaraj and Gnanapriya , Digital Signal Processing -.TMH.2009
6. Taan S.EIAli, Discrete Systems and Digital Signal Processing with MATLAB CRC press. 2009.

TIT 1033 SOFT COMPUTING

Module -I

Introduction: Soft Computing vs. hard computing, soft computing paradigms, Basic mathematics of soft computing, learning and statistical approaches to classification and regression.

Module -II

Neural Networks: Introduction, Biological neural network, learning paradigms. Artificial Neural Network (ANN): Evolution of Basic neuron modeling, Difference between ANN and human brain, McCulloch-Pitts neuron models, Learning paradigms, activation function, Single layer Perceptron, Perceptron learning, Windrow-Hoff/ Delta learning rule, Multilayer Perceptron, Adaline, Madaline, different activation functions, Back propagation network, momentum, limitation.

Module -III

Fuzzy Logic: Introduction, Need, classical sets (crisp sets) and operations on classical sets Interval Arithmetic's,Fuzzy set theory and operations, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Membership functions, fuzzification and defuzzification.

Module -IV

Fuzzy Rule Base System: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making.
Applications: Fuzzy logic in modeling and control, image processing.

Module -V

Genetic Algorithms: 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 such as TSP (Travelling salesman problem),
Applications: Genetic Algorithm based Back propagation Networks.

Module -VI & VII

Particle Swarm Optimization: Background, Operations of Particle Swarm Optimization, Basic Flow of Particle Swarm Optimization, Comparison between GA and PSO, Applications of PSO.
Ant Colony Optimization: Ant Colony Optimization Algorithm, Ant System, Ant Colony System, Basic Flow of Ant colony Optimization, Applications of ACO.

TEXT BOOK:

1. S.N. Sivanandam, Principle of Soft Computing, Wiley India.

REFERENCE BOOKS:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley-India Edition, 2007.
2. Davis E.Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y., 1989.
3. Sumati S., Hamsapriya T., Surekha P., Evolutionary Intelligence: An Introduction to Theory and Applications with MATLAB.

Elective –II

TIT 2011 WIRELESS ADHOC AND SENSOR NETWORKS

Module -I

Introduction: History of Wireless Networks: Introduction ,Different Wireless Networks. Wireless Transmission Fundamentals :Wireless Channels ,The Wireless Communication Graph, Power Assignment and Topology Control ,The Wireless Interference Graph, Related Graph Problems and Geometry Concepts ,Energy-Consumption Models, Mobility Models.

Module -II

Wireless MACs: 3 Wireless Medium-Access Control Protocols: Introduction, IEEE 802.11 Architecture and Protocols ,WiMAX, Bluetooth, MAC Protocols for Wireless Sensor Networks. TDMA Channel Assignment: Introduction, System Model and Assumptions , Centralized Scheduling , Distributed Algorithms, Weighted Coloring and Schedulable Flows . Spectrum Channel Assignment :Introduction , Network System Model , List-Coloring for Access Networks , List-Coloring for Ad Hoc Networks, Transition Phenomena on Channel Availability.CDMA Code Channel Assignment :Introduction ,System Model and Assumptions
Throughput and Bottleneck of General Graphs , Approximation Algorithms for Interference GraphsMaximum Weighted Independent Set for a General Wireless Network Model.

Module -III

Topology Control and Clustering : Clustering and Network Backbone :Introduction
Network Models and Problem Formulation , Centralized Algorithms for a Connected Dominating Set , Message Lower Bound for Distributed-Backbone Construction ,Some Backbone-Formation Heuristics ,Efficient Distributed-Nontrivial-Backbone-Formation Method ,Efficient Distributed-Backbone-Formation Method ,Linear-Programming-Based Approaches ,Geometry-Position-Based Approaches . Weighted Network Backbone : Introduction ,Study of Typical Methods ,Centralized Low-Cost Backbone-Formation Algorithms ,Efficient Distributed Low-Cost Backbone-Formation Algorithms , Performance Guarantee .

Module -IV

Topology Control with Flat Structures : Introduction ,Current State of Knowledge , Planar Structures ,Bounded-Degree Spanner and Yao's Family , Bounded-Degree Planar Spanner , Low-Weighted Structures , A Unified Structure: Energy Efficiency for Unicast and Broadcast ,Spanners for Heterogeneous Networks , Fault-Tolerant Structures . Power Assignment : Introduction , Power Assignment for Connectivity , Power Assignment for Routing Critical Transmission Ranges for Connectivity : Introduction ,Preliminaries ,Critical Range for Connectivity Critical Range for *k*-Connectivity , Connectivity with Bernoulli Nodes .

Module -V

Wireless Network Routing Protocols : Energy-Efficient Unicast Routing : Introduction
Proactive Approaches Reactive Approaches , Geographic Approaches ,Clustering and Hierarchical Routing .Energy-Efficient Broadcast/Multicast Routing : Introduction , Centralized Methods , Efficient Distributed or Localized Methods , Scheduling Active and Sleep Periods , Energy-Efficient Multicast . Routing with Selfish Terminals :Introduction , Preliminaries and Network Model, Truthful Payment Schemes for Multicast Sharing Multicast Costs or Payments Among Receivers, Existence of Truthful Payment Scheme ,Joint Routing, Channel Assignment, and Link Scheduling , Introduction ,System Model and Assumptions ,Problem Formulation for Cross-Layer Optimization , Efficient Link, Channel Scheduling .

Module -VI

Localization and Location Tracking : Introduction ,Available Information, Computational Complexity of Sensor Network Localization ,Progressive Localization Methods , Network-Wide Localization Methods Target Tracking and Classification , Experimental Location and Tracking Systems .

Module -VII

Performance Limitations of Random Wireless Ad Hoc Networks: Introduction , Capacity of Unicast for an Arbitrary Network ,Capacity of Unicast for Randomly Deployed Networks Capacity of Broadcast for an Arbitrary Network ,Capacity of Broadcast for Randomly Deployed Networks.Security of Wireless AdHoc Networks :Introduction ,Cryptography Fundamentals ,Key-Predistribution Protocols , Secure Routing Protocols.

TEXT BOOK:

1. XiangYang Li, Wireless Adhoc and Sensor Networks Theory and Applications, CAMBRIDGE UNIVERSITY PRESS.

RERENCE BOOKS:

1. Holger Kerl, Andreas Willig, Protocols and Architectures for Wireless Sensor Network, John Wiley and Sons.
2. Feng Zhao, Leonidas Guibas, Wireless Sensor Network, Elsevier, 1st Ed. 2004.
3. Kazem, Sohraby, Daniel Minoli, Taieb Zanti, Wireless Sensor Network: Technology, Protocols and Application, 1st Ed., John Wiley and Sons, 2007.
4. B. Krishnamachari, Networking Wireless Sensors, Cambridge University Press.
5. N. P. Mahalik, Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications Springer Verlag.

TIT 2013 CLOUD COMPUTING

Module-I

Introduction:

Cloud computing at a glance, Historical Developments, Building cloud computing environments, Computing Platforms and Technologies

Module-II

Principles of Parallel and Distributed Computing

Eras of computing, Parallel vs. Distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing

Module-III

Virtualization

Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples

Module-IV

Cloud computing architecture

Introduction, Cloud reference model, Types of clouds, Economics of the cloud, Open challenges

Module-V

Cloud platforms in industry and Cloud applications

Amazon web services, Google app engine, Microsoft azure, Observations, Scientific applications, Business and Consumer applications

Module-VI

Cloud Breaks

Cloud compliance, Data confidentiality and interoperability challenges, Security issues to cloud computing, securing the cloud

Module-VII

Advanced Topics in cloud computing

Energy efficiency in clouds, market based management of clouds, Federated clouds/ InterCloud, Third party cloud services

Text Books:

1. Rajkumar Buyya, C. Vecchiola, S. Thamarai Selvi,Mastering Cloud Computing, McGraw Hill
2. Nick Antonopoulos and Lee Gillam, Cloud Computing: Principles, Systems and Applications, Editors, springer publication

Reference Books:

1. Borko Furht Armando Escalante, Hand book of Cloud Computing, Editors, springer Publication.
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Cloud Computing for Dummies, Wiley Publication.
3. John W. Rittinghouse, JamesF. Ran some, Cloud Computing: Implementation, management and security, CRC Press, Taylor and Francis Publication.

TIT 2015 COMPUTATIONAL BIOLOGY

Module -I

Computational Gene Hunting: Introduction, Genetic Mapping, Physical Mapping, Sequencing, Similarity Search, Gene Prediction, Mutation Analysis, Comparative Genomics.

Module -II

Restriction Mapping: Introduction, Double Digest Problem, Multiple Solution of Double Digest Problem, Alternating Cycles in Coloured Graphs, Physical Maps and Alternating Eulerian Cycles, Partial Digest Problem, Homometric Sets, Some Other Problems.

Module -III

Map Assembly: Introduction, Mapping with Non-Unique Probes, Mapping with Unique Probes, Interval Graphs, Mapping with Restriction Fragment Fingerprints.

Sequencing: Introduction, Overlap, Layout and Consensus, Shortgun Sequencing, Shortest Superstring Problem.

Module -IV

Sequence Comparison: Introduction, Longest Common Subsequence Problem, Sequence alignment, Local Alignment, Gap Penalties, Space Efficient Alignment, Generalized Sequence Alignment and Duality, Approximate String Matching, Comparing a Sequence Against a Database, Multiple Filtration.

Module -V

Multiple Alignment: Introduction, Scoring a Multiple Alignment, Assembling Pairwise Alignment, Approximation Algorithm for Multiple Alignments, Assembling l-way alignments, Dot-Matrices and Image Reconstruction, Multiple Alignment via Dot-Matrix Multiplication.

Module -VI

Gene Prediction: Introduction, Statistical Approach to Gene Prediction, Similarity-Based Approach to Gene Prediction, Spliced Alignment, Reverse Gene Finding, Alternative Splicing, Hidden Markov Model.

Module -VII

Genome Rearrangements: Introduction, Breakpoint Graph, "Hard-to-Sort" Permutations, Reversal Distance, Signed Permutations, Interleaving Graphs and Hurdles, Safe Reversals, Clearing Hurdles, Sorting by Reversals, Duality Theorem, Genome Duplications.

TEXT BOOK:

1. Pavel A. Pevzner, Computational Molecular Biology - An Algorithmic Approach MIT Press, 2000.

REFERENCE BOOKS:

1. An Introduction to Bioinformatics Algorithms by Neil C. Jones and Pavel A. Pevzner, MIT Press, 2004.
2. Dan E. Krane and Michael L. Raymer, Fundamental Concepts of Bioinformatics Benjamin Cummings, 2003.

TIT 2017 SOFTWARE METRICS

Module –I

Introduction: Quality - Software Quality - Total Quality Management - Software Development Process Models. Fundamentals in Measurement - Basic Measures - Reliability and Validity - Measurement Errors - Assessing Reliability - Correction for Attenuation. Software Quality Metrics - Product Quality – Defect Density -Customer Problems, Satisfaction - In-Process Quality - Defect Density - Defect Removal -Defect Arrival - Metrics for Software Maintenance.

Module –II

Tools in Software Development: Tools in Software Development - Ishikawa's Seven Basic Tools – Checklist - Pareto Diagram – Histogram - Run Charts - Scatter Diagram - Control Chart - Cause-and-Effect Diagram - Relations Diagram. Defect Removal Effectiveness - Phase-Based - Process Maturity Level. The Rayleigh Model - Reliability Models - Reliability and Predictive Validity. Exponential Distribution and Reliability Growth Models - Jelinski-Moranda Model - Little wood Models - Goel-Okumoto Model - Musa-Okumoto Model – Model Evaluation.

Module -III

Process Metrics: In-Process Metrics for Software Testing - Test Progress S Curve - Testing Defect Arrivals Over Time - Product Size Over Time - CPU Utilization - Effort/Outcome Model. Complexity Metrics and Models - Lines of Code - Halstead's Software Science - Cyclomatic Complexity. - Syntactic Constructs – Structure Metrics. Metrics for Object-Oriented Projects - Concepts and Constructs - Design and Complexity Metrics- Lorenz Metrics and Rules of Thumb - CK OO Metrics Suite - Productivity Metrics.

Module -IV

Metrics & Assessments: Availability Metrics - Definition and Measurements - Reliability, Availability, and Defect Rate.Measuring and Analyzing Customer Satisfaction - Surveys - Data Collection - Sampling Methods - Analyzing Satisfaction Data. Conducting In-Process Quality Assessments - Preparation - Evaluation - Quantitative Data - Qualitative Data - Evaluation Criteria - Overall Assessment - Recommendations and Risk Mitigation. Conducting Software Project Assessments - Audit and Assessment - Process Maturity – Process Assessment Cycle - Assessment Results - Reports.

Module –V

Software Process Improvement: Measuring Process Maturity - Process Capability - Value of Process Improvement - Process Adoption - Process Compliance. Function Point Metrics to Measure Software Process Improvement – Software Process Improvement Sequences - Process Improvement Economics - Measuring Process Improvements at Activity Levels.

Module -VI&VII

Evaluating Software Engineering Technologies Through Measurement: The Uncertainty of Reliability Achievement methods, Actual Promotional Claims for Formal Methods, Use of Measurement in evaluating methods, Empirical evidence about Software Engineering, Management before technology, Formal methods for safety critical systems, Efficacy of formal methods, Class size driven metrics supported for risk management and decision making.

TEXT BOOKS:

1. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison Wesley, 2002.
2. Norman E. Fenton, Shari Lawrence Pfleeger, Software Metrics: A Rigorous and Practical Approach, PWS Pub. Co., 1998.

REFERENCE BOOKS:

1. Mark Lorenz, Jeff Kidd, Object-Oriented Software Metrics, Prentice Hall, 2000.
2. Robert B. Grady, Deborah L. Caswell, Software Metrics: Establishing a Company-wide Program, Prentice Hall, 1987.

TIT 2019 APPLIED COMPUTR VISION

Module –I

Image Formation and Image Models: Human eye, Cameras, Camera models, Camera Calibration, Light sources, Color, Color models.

Module –II

Early Vision: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Normalized Correlation and Finding Patterns, Scale and Image Pyramids.

Module –III

Edge Detection and Texture : Noise, Estimating Derivatives, Detecting Edges, Representing Texture, Analysis using Oriented Pyramids, Application: Synthesizing Textures for Rendering, Shape for Texture for Planes.

Module -IV

Segmentation: Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering, segmentation by fitting a model.

Tracking: Tracking with linear dynamic model.

Module –V

Finding Templates using Classifiers: Method for Building Classifiers, Building Classifiers from class histograms,

Feature Selection, Neural Networks, Support Vector Machine.

Module -VI and VII

Recognition by Relations between Templates: Finding Objects by Voting on Relationsbetween Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to PruneSearch, Hidden Markov Models, HMM and

Application: Sign Language understanding using HMM, automated recognition of people withHMM.

TEXT BOOK:

1. David A.Forsyth, Jean Ponce, Computer Vision-A Modern Approach, PHI, 2003.

REFERENCE BOOK:

1. Digital Image Processing and Computer Vision, 1/e, by Sonka.

TIT 2021 PATTERN RECOGNITION AND APPLICATION

Module -I

Introduction: Machine perception, pattern recognition examples, structure of a pattern recognition system, design cycle, learning and adaptation.

Module -II & III

Bayesian Decision Theory: Introduction**,** Bayesian decision theory-continuous features, minimum error rate classification, classifiers, discriminant functions and decision surfaces, normal density, discriminant functions for the normal density, Bayes decision theory-discrete features.

Maximum Likelihood and Bayesian Parameter Estimation: Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian case, Problems of dimensionality, Hidden Markov Models.

Module -IV

Nonparametric Techniques: Density estimation, parzen windows, k-nearest neighbor estimation, nearest neighbor
rule, nearest neighbor classification.

Module -V

Linear Discriminant Functions: Linear Discriminant Functions and decision surfaces, generalized linear discriminant functions, The two category linearly separable case, minimizing the perceptron criterion function, relaxation procedures, nonseparable behavior, minimum squared error procedures, support vector machines.

Module -VI

Supervised Learning: Multilayer neural network, Backpropagation algorithm, error surfaces, Backpropagation as feature mapping.

Module -VII

Unsupervised Learning and Clustering: Mixture densities and identifiably, maximum likelihood estimates, applications to normal mixtures, Bayes classifier, similarity measures, criterion functions for clustering.

Application of Pattern recognition: Handwritten digitrecognition using pattern recognition principle.

TEXT BOOK:

2. R.O.Duda et.al- Pattern Classification 2nd Edn, John Wiley, New York, 2002.

REFERENCE BOOKS:

1. Theodoridis & Koutroumbas, Pattern Recognition, Academic Press.
2. Maddipati Narasimha Murty, V. Susheela Devi, Pattern Recognition: An Algorithmic Approach, Springer.
3. Sankar K. Pal, Amita Pal, Pattern Recognition: From Classical to Modern Approaches, World Scientific.

TIT 2023 OPERATION RESEARCH

Module –I and II

Formulation of Engineering Optimization Problems: Decision variables, objective function and constraints.Example of typical design, operation and maintenance problems in engineering : Design of a water tank,design of a truss, design of a network (electrical, communication sewerage and water supply networks),product mix problem, transportation and assignment problems, shift scheduling of employees, design of reliable devices, design of reactors, shortest route problem, set covering problem, traveling salesman problems.

ModulE –III

Linear Programming Problem: Formulation, Graphical solution, Simplex method, Duality theory, Dual simple method, Formulation and solution of engineering problems of planning and scheduling.

Module -IV

Sensitivity Analysis, Transportation Problem, Assignment Problem, Network Models: Minimal Spanning Tree Problem, Maximal Flow Problem, Shortest Route Problem, Minimum Cost Flow Problem, Algorithms and applications.

Module –V

Integer Linear Programming Problem: Branch and Bound and Cutting Plane Methods,Zero-one Programming Problem, Knapsack Problem, Set covering Problem, Set Partitioning Problem, Traveling Salesman Problem.Deterministic Dynamic Programming Problems. Applications and algorithms.

Module -VI and VII

Queuing theory, Game theory, Simulation, Monte Carlo Simulation, Decision theory and Sequencing Problem.

TEXT BOOK:

1. Hamdy A. Taha, Operations Research: An Introduction, Pearson India.

REFERENCE BOOKS:

1. D. T. Phillips, A Ravindran and J.J. Solaberg, Principles of Operation Research, John Wiley and Sons.
2. B.E Gillett, Introduction to operations research, TMH.

TIT 2025 PARALLEL COMPUTING

Module –I
Need for Parallel Computing, Scope of Parallel Computing, Issues in Parallel Computing.

Module –II & III
Models of Parallel Computing: Taxonomy of Parallel Architectures, Networks: Dynamic Interconnection Networks, Static Interconnection Networks, Message Transfer, Reduction, Parallel Prefix, process and thread models.

Module -IV
Performance Modelling: Metrics, Granularity, Scalability, Overhead, Iso-efficiency
Principles of parallel algorithm design, decomposition techniques, mapping & scheduling computation.

Module -V
Matrix Algorithms: Matrix Partitioning, Matrix Transposition, Matrix Vector Multiply, Matrix Multiply, CUDA, vector add, matrix multiply, sequence alignment, Linear Equations, LU(P) Decomposition.

Module -VI
Searching and Optimization: The knapsack problem, Branch and Bound, Dynamic Programming.

Sorting: Sorting networks, Radix / Bucket sorts.

Module -VII
Graph algorithms: Minimum Spanning Tree, Single Source Shortest Paths, All Pairs Shortest Paths
Fast Fourier Transforms: Fourier Series, basis functions, Euler, Discrete and Fast Fourier Transforms.

TEXT BOOK:

1. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Introduction to Parallel Computing, Second Edition, Addison-Wesley, 2003, ISBN: 0201648652.

REFERENCE BOOK:

1. M. J. Quin, Parallel Computing: Theory and Practice, McGraw Hill, New York, 1994.

TIT 2027 NATURAL LANGUAGE PROCESSING

Module-I
Introduction to NLP, NLP tasks in syntax, semantics, and pragmatics, Applications such as information extraction, question answering, and machine translation, The problem of ambiguity,The role of machine learning. Brief history of the field.

Module-II
N-gram Language Models, The role of language models, Simple N-gram models, Estimating parameters and smoothing, Evaluating language models.

Module-III
Parts of Speech Tagging and Sequence Labeling : Lexical syntax, Hidden Markov Models, Maximum Entropy Models, Conditional Random Fields.

Module-IV
Syntactic parsing : Grammar formalisms and treebanks, Efficient parsing for context-free grammars (CFGs),Statistical parsing and probabilistic CFGs (PCFGs), Lexicalized PCFGs.

Module-V
Semantic Analysis: Lexical semantics and word-sense disambiguation, Compositional semantics, Semantic Role Labeling and Semantic Parsing.

Module-VI
Information Extraction (IE): Named entity recognition and relation extraction, IE using sequence labeling.

Module-VII
Machine Translation (MT): Basic issues in MT, Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

TEXT BOOK:

1. Jurafsky, D. and J. H. Martin, Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Second Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.

REFERNCE BOOKS:

1. Tanveer Siddique and U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford Unv. Press, New Delhi, India, 2008.
2. Allen, J.: Natural Language Understanding, The Benajmins/Cummings Publishing Company Inc. 1994.

Revised

TIT 2117 Software Metrics

Module-I

Measurement: Measurement in everyday life, The scope of software metrics, The basics of measurement- The representational theory of measurement, measurement and models, measurement scales and scales types.

Module-II

Goal based framework for software measurement: Classifying software measure, determining what to measure, applying the framework, software measurement validation, software measurement validation in practice.

Module-III and IV

Measuring internal product attributes: Size- Aspect of software size, Length, reuse, functionality, complexity, Measuring internal product attributes: structure-Types of structural measures, control flow structure, modularity and information flow attributes, object-oriented metrics, data structure, difficulties with general complexity measures.

Module V

Measuring external product attributes: Modeling software quality, measuring aspects of quality.

Module VI

Resource management: Productivity, Teams and tools- the meaning of productivity, productivity of what, measuring productivity, teams, tools and methods.

Module VII

Making process predictions: good estimates, cost estimation: problems and approaches, models of effort and cost, problems with existing modeling methods, dealing with problems of concurrent estimation methods, implications for process prediction.

Text Book:

1. Norman E. Fenton and James Bieman, Software Metrics: A Rigorous and Practical Approach , Third Edition, 2015, CRC Press, Taylor and Francis Group, Newyork, London.

Reference Book

1. Capers Jones, Applied Software Measurement, Third Edition, McGraw Hill, 2008.
2. Stephan. H. Kan, Metrics and Models in Software Quality Engineering, Addison Wesley, 2002.