M. Phil. (Computer Science) Programme

<2017-2018>

Department of Information and Communication Technology,

Fakir Mohan University,

Vyasa Vihar, Balasore-756019,

Odisha.

Scheme of Examination and

Detailed Syllabus for M. Phil. (Computer Science)

Sem.	Paper	Marks			Total Marks	Credit
		Term End Examination	Internal Assessment	Viva Voce		
I	MPCS11: Research Methodology	80	20	-	100	8
	MPCS12: Elective (any one from the List)	80	20	-	100	8
	MPCS13:Computer Application Laboratory Work	100	-	-	100	8
II	MPCS21:Project Work	250		50	300	24
Total					600	48

MPCS11: Research Methodology

MPCS12: One paper from the following list:

1	Bioinformatics	9	Wireless Sensor Network
2	Financial Engineering	10	Grid and Cloud Computing
3	Mobile Computing	11	Social Networking
4	Embedded System	12	Soft Computing and Pattern Recognition
5	Real Time System	13	Big Data Analysis
6	Cryptography and Network Security	14	Bio-inspired Computing
7	Simulation Modeling	15	Software Technologies
8	Digital Image Processing	16	Web Technologies and Services

MPCS13: Computer Application Laboratory Work

MPCS11: Research Methodology

Unit I: Research Definition, Importance and Meaning of Research, Characteristics of Research, Types of research, steps in research, Selection and Formulation of research problem, Sources of research problem, criteria / characteristics of a good research problem, errors selecting a research problem.

Research Design – Meaning, Objectives and contents of Research, Types of experimental Research Design, Collection of Primary Data-Observation Methods, questionnaire method and schedule methods.

Unit II: Hypotheses – meaning and characteristics of working hypotheses, problem in formulating hypotheses, sources of Hypotheses, Origin of hypotheses, types and significance of Hypotheses.

Case study Methods – Its Characteristics Advantages and limitation, Sampling techniques: Sampling Theory, types of sampling, Steps in sampling, Sampling and Advantages and Limitations of Sampling, Calculation of standard error's T-test and Z-Test, Chi-square tests, ANOVA- One-way/Two-way and analysis of variance

Unit III: Research Reports, Types of reports – contents – Format & Styles of reporting – steps in drafting reports – Editing the final draft-Evaluating the final draft. Analysis and Interpretation of Data and Report Writing, References, and Bibliography.

Unit IV: Software Packages: Matlab, R, SPSS, WEKA, ns2.

Reference Books:

1. C. R. Kothari, Research Methodology- Methods and Techniques, New Age International Publisher, New Delhi, 2011.
2. Berny H. Durston and M. Poole, Thesis and Assignment Writing, Wiley Eastern Ltd., New Delhi, 1970.
3. I. Gregory, Ethics in Research, Continuum, 2005.
4. S. C. Gupta and V. K. Kapoor, Fundamental of Mathematical Statistics, Sultan Chand and Sons, Educational Publishers, New Delhi.

MPCS12: List of Electives

1: Bioinformatics

Unit I: Introduction, Algorithms and Complexity: Biological Algorithms versus Computer Algorithms, Notations, Algorithm Design Techniques, Tractable versus Intractable Problems. Molecular Biology Primer: Genes, Molecules, Structure of DNA, Proteins, Analysis. Exhaustive Search: Restriction Mapping, Impractical Restriction Mapping Algorithms, A Practical Restriction Mapping Algorithm, Regulatory Motifs in DNA Sequences, Profiles, The Motif Finding Problem, Search Trees, Finding Motifs, Finding a Median String.

Unit II: Greedy Algorithms: Genome Rearrangements, Sorting by Reversals, Approximation Algorithms, Breakpoints: A Different Face of Greed, A Greedy Approach to Motif Finding. Dynamic Programming Algorithms: The Power of DNA Sequence Comparison, the Change Problem Revisited, the Manhattan Tourist Problem, Edit Distance and Alignments, Longest Common Subsequences.

Unit III: Sequence Alignment: Global sequence alignment, the Needleman and Wunsch algorithm, Scoring Alignments, Local Sequence Alignment, the smith-waterman algorithm. Alignment with Gap Penalties, Multiple Alignment, Gene Prediction, Statistical Approaches to Gene Prediction, Similarity-Based Approaches to Gene Prediction, Spliced Alignment. Divide and Conquer Approach to Sorting, Space Efficient Sequence Alignment, Block Alignment.

Unit IV: Graph Algorithms: Graphs and Genetics, DNA Sequencing, Shortest Superstring ,Problem, DNA Arrays as an Alternative Sequencing Technique, Sequencing by Hybridization, Fragment Assembly in DNA Sequencing, Protein Sequencing and Identification, The Peptide Sequencing Problem, Spectrum Graphs, Protein Identification via Database Search, Spectral Convolution, Spectral Alignment.
Combinatorial Pattern Matching: Repeat Finding, Hash Tables, Exact Pattern Matching, Keyword Trees, Suffix Trees, Heuristic Similarity Search Algorithms, Approximate Pattern Matching, BLAST: Comparing a Sequence against a Database.

Text Books:

1. Neil C. Jones and Pavel A. Pevzner, An Introduction to Bioinformatics Algorithms, MIT Press, 2004.

2. Ion Mandoiu and Alexander Zelikovsky, Bioinformatics Algorithms, Techniques & Applications, Wiley Inter-Science, 2008
3. Wing-Kin Sung, Algorithms in Bioinformatics: A Practical Introduction, CRC Press (Taylor & Francis Group), 2009.

Reference Books:

5. T.K. Attwood and Phukan Smith, Introduction to Bioinformatics, Pearson Education.
6. B. Bergeron, Bio-informatics Computing, Pearson Education.
7. J.M Claverie and C.N. Notredame, Bioinformatics- A beginners Guide, Wiley Pub.

2: Financial Engineering

Unit I: Introduction to Stochastic Calculus: Martingales, Brownian motions, Diffusions and stochastic differential equations, It's lemma, Girsanov's theorem.

The Fundamental Theorem of Asset Pricing: Arbitrage, numeraires and martingale measures, The martingale property of asset prices, The martingale property of forward and futures prices, The risk-neutral martingale measure, and the forward martingale measure.

Unit II: Martingale Pricing and Monte Carlo Simulation: The martingale approach to derivative pricing. Examples: Black-Scholes and Black formulas. Monte Carlo simulation. Euler discretization. Choleski decomposition. Estimating the greeks through Monte Carlo simulation.

Unit III: Introduction to Equity Derivatives: Key features of empirical volatility surfaces for equity derivatives. Implications for price distributions. Time-series evidence from the VIX. Volatility derivatives. Variance swaps: pricing and synthetic replication. The construction of the VIX. Quantos. Hedging with stochastic volatility and jumps.

Unit IV: Introduction to Fixed Income Derivatives: Basic instruments (swaps, caps and oors, swaptions). The market pricing formulas and quoting conventions. Empirical volatility surfaces for xed income derivatives. Pricing caps, oors and swaptions as bond options.

Modeling Volatility: Local volatility models: the constant elasticity of variance (CEV) model and the implied volatility function (IVF) model. Stochastic volatility models: the Heston model. Calibration and Monte Carlo implementation of stochastic volatility models.

Text Books:

1. John C. Hull, Options, Futures, and Other Derivatives, 6th edition, Prentice Hall, 2005.
2. Paul Glasserman, Monte Carlo Methods in Financial Engineering, 1st edition, Springer,2004.
3. Riccardo Rebonato, Volatility and Correlation, 2nd edition, Wiley, 2004.

Reference Books:

1. Damiano Brigo and Fabio Mercurio, Interest Rate Models - Theory and Practice, 2nd edition, Springer, 2006.
2. Riccardo Rebonato,Modern Pricing of Interest-Rate Derivatives: The LIBOR Market Model and Beyond, 1st edition, Princeton University Press, 2002.
3. Philipp J. Schonbucher, Credit Derivatives Pricing Models, 1st edition, Wley, 2003.

3: Mobile Computing

Unit I: Applications, history of mobile communication, introduction to GSM system, GSM background, GSM operational and technical requirements. Cell layout and frequency planning, mobile station, base station systems, switching sub systems, home locations, register, Visiting Location Register (VLR), equipment identity register, echo canceller. GSM network structure, Recent Advances and application Standards in Mobile OS.

Unit II: Time and Frequency Domains representations, structure of TDMA slot with frame; Time organization of signaling channels, frequency hopping. TDMA standards and Applications, Time Organization of signaling Channels.

Mobility Management, Signaling protocols, steps in formation of a call, location updates, MS-PSTN call, PSTN-MS call, MS-MS call, call handover. Functioning and types of PSTN networks.

Unit III: Security issues in mobile computing, Authentication, encryption, Characteristics of SIM, equipment identification. Security Application development for Mobile OS.

Unit IV: Multiplexing issues in time and frequency domains, FDMA, TDMA, CDMA, Physical layer, data link layer, MAP Protocols, MTP3, SCCP, TCAP protocol, message formation, MAP protocol-MAP protocol for MM, MAP protocol for basic service support. Application layers RR-layer, MM-layer, CC-Layer, API's for mobile application development.

Text Books:

1. Asha Mehrotra, GSM System Engg., Artech House
2. William C.Y. Lee, Mobile Communication Design Fundamentals, Wily Series in Telecommunication

Reference Books:

1. Jerry D. Gibson, The Mobile Communication Handbook, IEEE Press
2. Jochen Schiller, Mobile Communication, Pearson Education Asia
3. V. Garg and E.Joseph, Wilkes—Wireless and personal Communications Systems, Prentice Hall
4. Lauren Darcey and Shane Conder, Android: Wireless Application Development Developer's Library, 2nd Edition, Addison Wesley.

4: EMBEDED SYSTEMS

Unit I: Introduction: An embedded system, Processor in the system, other hardware units, software embedded into a system, exemplary embedded system-on-chip (SOC) and VLSI circuit

Unit II: Devices and Device Drivers ; I/O devices, Timer and counting devices, serial communication using the IC, CAN and advance I/O buses between the networked multiple devices, Host system or Computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advance buses, Device drivers, Parallel port devices drivers in a system, Serial port device drives in a system, Interrupt servicing (Handling) mechanism.

Unit III: Software and Programming Concept: Processor selection for an embedded system, memory selection for an embedded system, Embedded programming in C ++, Embedded programming in JAVA, Unified modeling language (UML), multiple processes and application, problem of sharing data by multiple tasks and routines, Inter process communication.

Unit IV: Real time Operating System: Operating system services, I/O subsystem, Network operating system, Real Time and embedded system, Need of well tested and debugged Real time operating system (RTOS), Introduction to C/ OS- II.

Case studies of programming with RTOS : Case study of an embedded system for a smart card Hardware and Software Co-design : Embedded system project management, Embedded system design and co-design issues in system development process, design cycle in the development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

Text Books

1. Raj Kamal, Embedded Systems: Architecture, Programming, and Design, TMH, 2003

2. Felice Balarin et al., Hardware Software Co-design of Embedded System, Kulwer Academic Publishers,

3. Sriram V. Iyer and Pankaj Gupat, Embedded Real time system Programming, TMH

5: Real Time System

UNIT I: Introduction: Issues in real-time system, task classes, architecture issues, operating system. Issues, performance measure for real time systems, estimating program run times, classical uniprocessor scheduling algorithm, uniprocessor scheduling of IRIS tasks, task assignment, mode changes, fault tolerance scheduling.

UNIT II: Programming Languages and Tools: Introduction, desirable languages characteristics, data types, control structures, facilitating hierarchical decomposition packages, exception handling, overloading and generics, multitasking, low-level programming, task scheduling, timing specification, programming environments, run-time support.

UNIT III: Real-Time Database & Communication: Basic definitions, real time vs. general purpose databases, main memory databases, transaction priorities, transaction aborts, concurrency control issues, disk scheduling algorithms, two-phase approach to improve predictability, maintaining serialization consistency, databases for real-time systems, communication network topologies, communication protocols.

UNIT IV: Fault -Tolerance Techniques: Introduction, failure causes, fault types, fault detection, fault and error containment, redundancy, data diversity, reversal checks, malicious or Byzantine failures, integrated failure handling.

Reliability & Clock Synchronization: Introduction, obtaining parameter values, reliability models for hardware redundancy, software error models, taking time into account, clock synchronization, nonfault-tolerant synchronization algorithms, impact of faults, and fault tolerant synchronization in hardware.

Text Book:

1. C.M. Krishna and Kang G. Shin, Real-Time systems, McGraw Hill, 2004.

Reference Books:

2. R.J.A. Buhr, D.L. Bailey, An Introduction to Real-Time Systems, Prentice-Hall International, 1999.
3. Rajib Mall, Real Time Systems: Theory and Practices, Person Education.

6: Cryptography and Network Security

Unit I: Introduction to Information Security: Security Goals, Attacks, Security Services and Mechanisms, Mathematical Background: Integer and Modular Arithmetic, Matrices, Linear Congruence. Groups, Rings, and Fields, GF(p), Euclidean and Extended Euclidean Algorithms, Polynomial Arithmetic, GF(2n). Random Number Generation, Prime Numbers, Fermat's and Euler's Theorems, Primality Testing Methods, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms.

Unit II: Traditional Encryption Methods: Symmetric Cipher Model, Substitution Ciphers, Transposition Ciphers, Block and Stream Ciphers, Rotor Cipher, Steganography. Symmetric Key Ciphers: Data Encryption Standard, Advanced Encryption Standard. Asymmetric Key Ciphers: RSA Cryptosystem, ElGamal Cryptosystem, Elliptic Curve

Unit III: Cryptosystem. Message Integrity, Authentication: Message Integrity, Random Oracle Model, Message Authentication, MAC Algorithms. Cryptographic Hash Functions: MD Hash Family, Whirlpool, Secure Hash Algorithm. Digital Signature and Authentication: Digital Signature Schemes, Variations and Applications, Entity Authentication.Key Management: Diffie-Hellman Key Exchange.

Unit IV: Network and System Security:Security at the Application Layer: e-mail security, PGP and S/MIME. Security at the Transport Layer: Secure Socket Layer (SSL) and Transport Layer Security (TLS). Security at the Network Layer: IP Security. System Security: Malicious Software, Malicious Programs, Viruses, Worms, Malware, Intrusion Detection System, Firewalls.

Text Books:

1. B. A. Forouzan & D Mukhopadhyay ,Cryptography and Network Security., McGraw Hill, 2nd ed.2010

References:

1. B. Menezes ,Network Security and Cryptography., Cengage Learning, 1st ed.2010
2. Stallings ,Cryptography and Network Security., PHI, 4th ed.2010

7: Simulation Modeling

Unit I: Selected illustrative examples of simulation applications. Models: Structural, Process, Continuous, Discrete, Deterministic, Random, input/output, static, dynamic, multilevel.

Unit II: Simulation: Analog/Digital/Hybrid, verification, validation. Data Modeling and Analysis Population parameters, hypotheses testing, confidence-intervals, goodness of fit, estimating transient/steady-state characteristics, variance reduction. Simulation Process :

Unit III: Problem formulating, model building, data acquisition, model translation, verification, validation, strategic and tactical planning, experimentation, analysis of results.
Implementation and documentation. Simulation Languages: Examples from SIMSCRIPT, GPSS, GASP, SIMULA, etc.

Unit IV: Branch and Bound algorithm for solution of integer Programming Problems , General characteristics of a queuing model, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline.

Text Books:

1. G.Gordon, System Simulation, 2nd ed., Prentice Hall, 1978.

2. Narsing Deo, System Simulation with Digital Computers, Prentice Hall, 1976.

3. J.R. Leigh, Modelling and Simulation, Peter Peregrims Ltd., 1983.

4. A.M.Law, W.D.Kelton, Simulation Modelling and Analysis, Mcgraw Hill, 1982.

5. H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, “Operations Research”, Eighth Edition, Pearson Education

8: Digital Image Processing

Unit I: Digital image Processing-Fundamental steps in image Processing-Elements of image processing systems. Digital image fundamentals: A simple image model-sampling and quantization-some basic relationships between pixels. Introduction to Fourier transform-the discrete Fourier transform-properties of the two-dimensional Fourier transform.

Image Enhancement: Enhancement by point processing-spatial filtering-enhancement in the frequency domain-generation of spatial masks forms frequency domain specifications-color image processing.

Unit II: Image restoration: Degradation model-diagonalization of circulant and block circulant matrics-Algebraic approach to restoration- inverse filtering. Image compression: Fundamentals- image compression models – error- free compression- lossy compression – image compression standards.

Unit III: Image segmentation: Detection of discontinuities – edge linking and boundary detection – thresholding region oriented segmentation. Representation and description: representation schemes – boundary descriptors – regional descriptors. Elements of image analysis – Patterns and Patterns classes – decision theoretic methods – structural methods- interpretation.

Unit IV: Image processing – pattern recognition – relationship between image processing and pattern recognition. Objects detection: introduction. Shape analysis: introduction – convex hull – convex hull based representation – fractals – fractals based image shape representation.
Wavelets: introduction – properties of wavelets – fast wavelet transform – wavelet decomposition structures and coefficients- inverse fast wavelet transform – application of wavelets in image processing.

TEXT BOOK:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing using MATLAB”, Perrson Education, 2004.
2. Rafael C. Gonzalez, Richard E.Woods, “Digital Image Processing”, 2nd ed., Prentice Hall, NJ.,2002
3. Russ J.C., “The image processing handbook”, 3rd ed., CRC Press,1999.

9: Wireless Sensor Networks

Unit I: Routing Cellular and Ad hoc wireless networks; Issues of MAC layer and outing; Proactive, Reactive and Hybrid Routing protocols; Multicast Routing; Tree based and Mesh based protocols; Multicast with Quality of Service Provision.
Quality of Service: Real-time traffic support; Issues and challenges in providing QoS; Classification of QoS Solutions; MAC layer classifications; QoS Aware Routing Protocols; Ticket based and Predictive location based Qos Routing Protocols.

Unit II: Energy Management Ad Hoc Networks: Need for Energy Management; Classification of Energy Management Schemes; Battery Management and Transmission Power Management Schemes; Network Layer and Data Link Layer Solutions; System power Management schemes

Unit III: Mesh Networks: Necessity for Mesh Networks; MAC enhancements; IEEE 802.11s Architecture; Opportunistic Routing; Self Configuration and Auto Configuration; Capacity Models; Fairness; Heterogeneous Mesh Networks; Vehicular Mesh Networks

Unit IV: Sensor Networks: Introduction to Sensor Network architecture; Data Dissemination; Data Gathering; MAC Protocols for sensor Networks; Location discovery; Quality of Sensor Networks; Evolving Standards.

TEXT BOOK:

1. Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks – Architectures and Protocols, C., Pearson Education, 2004.

Reference Books:

1. Feng Zhao and Leonidas Guibas, Wireless Sensor Networks, Morgan Kaufman Publishers, 2004.
2. C.K.Toh , Adhoc Mobile Wireless Networks, Pearson Education, 2002.
3. Thomas Krag and Sebastin Buettrich , Wireless Mesh Networking , O'Reilly Publishers, 2007

10: Grid and Cloud Computing

Unit I: Principles of parallel algorithm design: Preliminaries, Decomposition techniques, Characteristics of tasks and interactions, Mapping techniques for load balancing, Methods for containing. Interactions overheads, Parallel algorithm models. Basic communication operations: One-to-All Broadcast and All-to-One Reduction, All-to-All broadcast and reduction All-Reduce and prefix sum operations, scatter and gather, All-to-All personalized communication, circular shift, Improving the speed of some communication operation.

Principle of message – Passing programming, Send and receive operations, The message passing interface, Topologies and embedding, Overlapping communication with computation, collective communication and computation operations, Groups and communicators.

Unit–II: Grid Service Architecture and Application: The open grid services architecture (OGSA), Creating and Managing Grid Services, Web Services and Utility Computing, Grid-Enabling Software Applications, Management of Grid Environments, Grid Enhanced Applications in Research and Industry.

Design and Implementation of the Grid Model: Model, Design and Implementation of the model, Parallel Simulated Annealing Algorithms, Simulated Annealing Technique, Scheduling and Resource Management, Security and Data Handling, Quality of Services.

Unit III: Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

Unit IV: Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g., Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

Text Books:

1) Introduction to Parallel Computing, Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar Person Education.

2) D. Janakiram, Grid Computing, PHI.

3) Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications [ISBN: 978-0521137355]

4)Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach [ISBN: 0071626948].

11: SOCIAL NETWORK

Unit I: Introduction: Introduction and terminology, market views, applications, the business of social networking, Examples of social media- multimedia, entertainment, news/opinion, communication, major social networks , social networking websites. Basic properties of networks and actors, connections embedding, Centrality and power, Cliques and sub-groups,

Network positions and social roles: The analysis of equivalence, Similar and Structural equivalence, Automorphic equivalence, Regular equivalence, Multiplex network, Two mode networks.

Unit II: Current Situation In Selected Areas Of Social Networks: Social Graphs ,Social graph expansion, Facebook open graph, Microblogging ,Identity Algorithms And Apis ,OAuth, opened, Social Media Search And Management In Large Scale,Social media search ,Content management in large scale, Human powered and community question answering, Mobility And Geolocation ,Social Rankings And Vertical Social Networks, Business And Social Networking ,Social Businesses ,Social Analytic tools ,Social Television , Social Gaming, Social Networks - Research Challenges ,

Unit III: Social network data: Social network data, statistical tools, Populations, samples, and boundaries, Modality and levels of analysis, Sampling ties ,Formal methods, Full network methods, Snowball methods, Ego-centric networks (with alter connections), Ego-centric networks (ego only) ,Multiple relations , Scales of measurement , Binary measures of relations, Multiple-category nominal measures of relations, Grouped ordinal measures of relations, Full-rank ordinal measures of relations, Interval measures of relations, statistics and social network data

Unit IV: Using graphs and matrix to represent social relations: Graphs and Sociograms, Kinds of Graphs, Levels of Measurement: Binary, Signed, and Valued Graphs, Directed or "Bonded" Ties in the Graph, Simplex or Multiplex Relations in the Graph, working with Netdraw to visualize graphs, Matrices to Represent Social Relations, the "Adjacency" Matrix, Matrix Permutation, Blocks, and Images, Mathematical Operations on Matrices, working with network data.

Text Books:

1. Wasserman, Stanley; Faust, Katherine (1994). "Social Network Analysis in the Social and Behavioral Sciences". *Social Network Analysis: Methods and Applications*. Cambridge University Press. pp. 1–27.ISBN 9780521387071.
2. Kilduff, M., Tsai, W. (2003). *Social networks and organisations*. Sage Publications.
3. Wellman, Barry; Berkowitz, S.D. (1988). *Social Structures: A Network Approach*. Structural Analysis in the Social Sciences. Cambridge University Press

4. Borgatti, Stephen P.; Mehra, Ajay; Brass, Daniel J.; Labianca, Giuseppe (2009). "Network Analysis in the Social Sciences". *Science* 323 (5916): 892–895.

Reference Books:

1. Scott, John P. (2000). *Social Network Analysis: A Handbook* (2nd edition). Thousand Oaks, CA: Sage Publications.
2. Nooy, Wouter (2012). *"Graph Theoretical Approaches to Social Network Analysis." in Computational Complexity: Theory, Techniques, and Applications (Robert A. Meyers, ed.)*. Springer. pp. 2864–2877.
3. Kadushin, C. (2012). Understanding social networks: Theories, concepts, and findings. Oxford: Oxford University Press.

12: SOFT COMPUTING AND PATTERN RECOGNITION

Unit I: Introduction to Soft Computing, Artificial Neural Network (ANN) : Fundamentals of ANN, Basic Models of an artificial Neuron, Neural Network Architecture, Learning methods, MLP, RBF Network.

Fuzzy set theory: crisp sets, fuzzy sets, crisp relations, fuzzy relations, Fuzzy Systems: Crisp logic predicate logic, fuzzy logic, fuzzy Rule based system, Defuzzification Methods, Fuzzy rule based reasoning.

Fundamentals of genetic algorithms: Encoding, Fitness functions, Reproduction. Genetic Modelling.

Unit II: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test. Features, Feature Vectors and Classifiers, Supervised vs. unsupervised pattern.

Unit III: Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminates functions. Classifier based on Bayes Decision Theory, Linear classifier: Least square methods, Mean square estimation, Support vector machines, nonlinear classifier: Two layer & three layer perceptron, Back propagation algorithm, combining classifiers

Unit IV: Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminates analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification. Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

Text Books:

1. J. S. R. JANG, C.T. Sun, E. Mitzutani, Neuro Fuzzy and Soft Computing, PHI.
2. Richard O. Duda, Peter E. Hart and David G. Stork, Pattern Classification, 2nd Edition, John Wiley, 2006.
3. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Edition, Academic Press, 2009.

Reference Books:

1. S. N. Sivanandan and S. N. Deepa, Principles of Soft Computing, Wiley India, 2nd Edition, 2011.

2. S. Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithm (synthesis and Application), PHI.

3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2009.

13: Big Data Analysis

UNIT I: Introduction to Big Data Analytics, Overview of SQL and intro to R , Using R for Initial Analysis of the Data

UNIT II: Advanced Analytics and Statistical Modeling for Big Data – Theory and Methods, Technology and Tools

UNIT III: Architecture of Big Data Analysis, Big Data Analytics Lifecycle.

Unit IV: Big Data Analysis and Cloud Computing

Text Books:

1. Michael Minelli, Michele Chambers, and Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley, 2013.
2. D. P. Acharya, S. Dehuri, and S. Sanyal, Computational Intelligence for Big Data Analysis: Frontier Advances and Applications, Springer International Publishing AG Switzerland, 2015.

14: Bio-inspired Computing

UNIT I: Natural to Artificial Systems-Biological Inspirations in problem solving –Behavior of Social Insects: Foraging- Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting- Nest Building-Cooperative transport.

UNIT II: Ant Colony Optimization [ACO]: Ant Behavior –Towards Artificial Ants –Combinatorial Optimization – Ant Colony Optimization Metaheuristic – Problem solving using ACO-Extensions of Ant Systems – ACO and Local search methods –ACO theoretical considerations and Convergence.
Ant Colony Optimization algorithms for NP-hard problems -Routing problems-Assignment problems-Scheduling problems- Subset problems – Machine Learning Problems –ACO for Travelling salesman problem.

UNIT III: Swarm Intelligence: Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Particle Swarms for dynamic optimization problems.

UNIT IV: Biological Inspired computing to Natural Computing – Integration of Evolutionary Computation. Components in Ant Colony Optimization – Particle Swarm Optimization based on Socio-cognition.

Text Books:

1. Marco Dorigo, Thomas Stutzle, “Ant colony Optimization”, MIT Press,2004.
2. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, “Swarm Intelligence:From Natural to Artifical Systems”, Oxford University press,2000.
3. Christian Blum, Daniel Merkle (Eds.), “Swarm Intelligence: Introduction and Applications”, Springer Verlag, 2008.
4. Leandro N De Castro, Fernando J Von Zuben, “ Recent Developments in Biologically Inspired Computing”, Idea Group Inc., 2005.

15: Software Technologies

UNIT I: SOFTWARE MANAGEMENT CONCEPTS: Software Process, Software Project Metrics, Software Project Planning, Risk Management.

UNIT II: SOFTWARE QUALITY ASSURANCE: Quality Concepts, Quality Movement, Software Review, Software Quality Assurance, Formal Technical Reviews.

UNIT III: SOFTWARE TESTING: Software Testing Fundaments, Test Case Design, Basic Path Testing, A Strategic approach to software.

UNIT IV: ENTERPRISE APPLICATION INTEGRATION: Concepts and challenges of integrating different application, Different heterogeneous platform, EAI architecture, EAI approaches data level, Application/ process level, method level.
MESSAGING CONCEPTS AND SERVICES**:** Messaging concepts and various types of messaging services, Middleware and adapter services, Transaction middle aware, EAI process methodology

Text Book:

1. Roger S. Pressman, Software Engineering, 5th Edition, Mc Graw Hill.

16: Web Technologies and Services

UNIT I: HTML, DHTML AND SCRIPTING LANGUAGE: Common tags-HTML Tables and formatting internal, Linking-Complex HTML forms, Java Scripts-Control structures, DHTML-CSS-event model –filters & transitions.

UNIT II: APPLETS AND AWT PROGRAMMING: Review of Applets, Class, Event Handling, AWT Programming, Introduction to Swing: Japplet, Handling Swing Controls, Tables, Differences between AWT Controls & Swing Controls, developing a Home page using Applets & Swing, Multi-Threading and RMI.

UNIT III: JAVA BEANS AND SERVLETS: Introduction and Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties, persistence, Customizers, Java Beans API, Life Cycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization Parameters, The Javax.servlet HTTP Package, Handling, Http Request & responses, Using Cookies- Sessions Tracking Security Issues.

UNIT IV: JSP: Introduction to JSP: The problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Tomcat Server & Testing Tomcat, JSP Application Deployment .
JDBC: Database Access, Database Programming using JDBC, Studying javax.sql.* package, Accessing a Database from a JSP Page

Text Books:

1. D. Dietel and Nieto, Internet and World Wide Web – How to program, Pearson Education Asia.(Chapters: 3,4,8,9,10,11,12-18).
2. Patrick Naughton and Herbert Schidt , The Complete Reference Java 2 ,3rd Edition (Chapters: 19,20,21,22,25,27).
3. Hans Bergstan, Java Server Pages (Chapters: 1-9).

MPCS13: Computer Application and Laboratory Work

A: Computer Application: Theory

Components of personal Computer: Central Processing Unit (CPU), Storage Device, Input Output Device, Other Accessories and Ports. Software: Introduction to Operating System, Language Software, Application Software, Utility Software. **MS-DOS Windows Basic Operations:** File management operations, operating system maintenance, protection from virus, worms, internet malware, spyware etc. Functions of MS-Office: Basic functions of Word, Excel, Power point and Access.

B: Computer Application Laboratory work

Text Book:

1. Computers, Concepts, and Uses 2nd ed., Summer M., Englewood Cliffs, New Jersey, Prentice Hall Inc, 1988