

## MCA

Sl.No	Subject Code	Name of the Subject
1	14PHDMCA001	Soft Computing
2	14PHDMCA002	Computer Vision
3	14PHDMCA003	Web Technologies
4	14PHDMCA004	Information & Network Security
5	14PHDMCA005	Advanced Operating System And Compiler Design
6	14PHDMCA006	Advance Computer Network
7	14PHDMCA007	Advanced Software Engineering
8	14PHDMCA008	Advance Database Management System
9	14PHDMCA009	Computer Graphics & Visualization
10	14PHDMCA010	Advanced Algorithms
11	Compulsory	Research Methodology

## **14PHDMCA001: Soft Computing**

**Unit 1. Neural Networks:** History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

**Unit 2. Fuzzy Logic:** Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Complement, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets..

**Unit 3. Neuro-Fuzzy Systems:** Architecture of Neuro Fuzzy Networks, Applications of Fuzzy Logic: Medicine, Economics etc.

### **Unit 4. Artificial Intelligence**

AI problems, AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation. Searching: Searching for solutions, uniformed search strategies, Heuristic functions. Constraint satisfaction problems: Game Playing Alpha-Beta pruning, Evaluation functions, cutting of search, Knowledge Representation & Reasons logical Agents, logic, propositional logic, Resolution patterns in propositional logic, Resolution, Forward & Backward Chaining, Planning – Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state.

**Unit 5. Genetic Algorithms:** An Overview, GA in problem solving, Implementation of GA, Genetic Algorithms: survival of the fittest principle in Biology, Genetic Algorithms, Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms.

### **TEXT BOOKS:**

1. Anderson J.A.: An Introduction to Neural Networks, PHI, 1999.
2. Hertz J. Krogh, R.G. Palmer: Introduction to the Theory of Neural Computation, Addison-Wesley, 1991.
3. G.J. Klir & B. Yuan: Fuzzy Sets & Fuzzy Logic, PHI, 1995.
4. Stuart Russel, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, PHI/Pearson Education.
5. Patrick Henry Winston, “Artificial Intelligence”, 3rd Edition, Pearson Education.
6. Melanie Mitchell: An Introduction to Genetic Algorithm, PHI, 1998.

## **14PHDMCA002: Computer Vision**

**Unit 1: Introduction to Image Processing:**Origins of Digital Image Processing, examples, Fundamental Steps in Digital ImageProcessing, Components of an Image Processing System, Image analysis and computer vision, spatialfeature extraction, transform features, Edge detection, gradient operators, compass operators, stochastic gradients, line and spot detection.

**Unit 2: Digital Image Fundamentals:** Elements of Visual Perception, A Simple Image Formation Model, Basic Concepts in Sampling and Quantization, Representing Digital Images, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.Some Basic Gray Level Transformations, HistogramProcessing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing.

**Unit 3: Image Enhancement in the Frequency Domain:** Background, Image Enhancement in the Frequency Domain, Introduction to the Fourier Transform and the Frequency, Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Holomorphic Filtering. A Model of the Image degradation/Restoration process, Noise Models. Transformation: Discrete Cosine Transforms, Walsh Hadward Transforms, Wavelet Transforms and Multiprocessing, Background, Multiresolution Expansions, Wavelet Transforms in one Dimension

**Unit 4:Introduction to Pattern Recognition:**Applications of pattern recognition, statistical decision theory, Nonparametric Decision Making: Introduction, histograms, Kernel and window estimators, nearest neighbour classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.  
Clustering:Introduction, hierarchical clustering, partitional clustering

**Unit 5: Processing of Waveforms and Images:** Introduction, gray level scaling transformations, equalization, geometric image and interpolation, Smoothing, transformations, edge detection, Laplacian and sharpening operators, line detection and template matching, logarithmic gray level sealing, the statistical significance ofimage features.

### **References**

1. Rafael C Gonzalez and Richard E. Woods: Digital Image Processing, 3rd Edition, Pearson Education, 2003.
2. Scott.E.Umbaugh: Computer Vision and Image Processing, Prentice Hall, 1997.
3. EartGose, Richard Johnsonburg and Steve Joust, "Pattern Recognition and Image Analysis", Prentice-Hall of India-2003.
4. Duda and Hart, "Pattern recognition (Pattern recognition a scene analysis)".

## **14PHDMCA003: Web Technologies**

**UNIT-1: Cloud Computing Basics:** Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud Introduction to Cloud Computing. Cloud Computing Technologies: Hardware and Infrastructure: Clients, Security, Network, services Accessing the Clouds: Platforms, WEB applications, WEB APIS, WB Browsers Cloud Storage: Overview, Storage provides, Cloud Standards: Applications, Client, Infrastructure, Services.

**UNIT-2 Cloud Computing Mechanisms:** Software as a service: Overview, Driving Forces, Company offerings, Industries, Software + services: Overview, Mobile Device Integration, Providers, Microsoft Online Application development: Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect, Development Platforms: Google, Sales Force, Azure. Local Clouds: Virtualization, server solutions, Thin Clients Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analyzing the service.

**UNIT-3 Cloud Services:** Collaborating on Calendars, Schedules, and Task Management, Collaborating on Event management, Collaborating on Contact management, collaborating on Project Management, Collaborating on Word Processing, Collaborating on Spread sheets, Collaborating on Databases, Collaborating on presentations, Storing and sharing Files and other online content, sharing Digital Photographs, controlling the collaborations with Web-Based Desktops.

**UNIT-4 XML and Web** - XML Language Basics, XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure, Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns And Faults - SOAP With Attachments.

### **UNIT-5 WEB SERVICES**

Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE, XML SECURITY-Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice

### **References**

1. Cloud Computing a Practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL, 2010 Edition
2. Cloud Computing-Web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education, 2009 Edition
3. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
4. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.
5. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.2. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers,2005.

## 14PHDMCA004: Information & Network Security

### Unit 1

**Overview:** Services, Mechanisms and attacks, OSI security architecture, Model for network security.

**Classical Encryption Techniques:** Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography, Problems.

**Block Ciphers and DES (Data Encryption Standards):** Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems.

### Unit 2

**Public Key Cryptography and RSA:** Principles of public key cryptosystems, RSA algorithm, Problems.

**Other Public Key Crypto Systems and Key Management:** Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Problems.

**Message Authentication and Hash Functions:** Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of hash functions and MAC's, Problems.

### Unit 3

**Digital Signature and Authentication Protocol:** Digital signature, Authentication protocols, Digital signature standard.

**Authentication Applications:** Kerberos, X.509 authentication service, Kerberos encryption technique, Problems.

**Electronic Mail Security:** Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator.

### Unit 4

**IP Security:** Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Security associations, Key management.

**Firewalls:** Firewall design principles; Trusted systems, Problems.

### Unit 5

**Elementary number theory:** Congruence's, Applications to factoring, Finite fields, Quadratic residues and reciprocity, simple cryptosystems, public key cryptography, RSA, discrete logs, Primarily and factoring, The rho method, Fermat factorization, Continued fractions and Quadratic Sieve methods

### References

1. William Stallings, "Cryptography and Network Security," 3rd edition, Pearson Education (Asia) Pte. Ltd./Prentice Hall of India, 2003

- 2.C. Kaufman, R. Perlman, and M. Speciner, "**Network Security: Private Communication in a Public World**", 2nd edition, Pearson Education (Asia) Pte. Ltd. 2000
- 3.Atul Kahate, "**Cryptography and Network Security**", Tata McGraw-Hill, 2003
- 4.Eric Maiwald, "**Fundamentals of Network Security**", McGraw-Hill, 2003
- 5.Niven I, Zuckerman H, Montgomery H L, Introduction to the theory of numbers, John Wiley, 2000
- 6.Koblitz N., Introduction to Number Theory and Cryptography, Springer Verlag, 1994

## **14PHDMCA005: Advanced Operating System and Compiler Design**

### **UNIT – 1 OPERATING SYSTEM STRUCTURES**

System Structure, Virtual Machines, System Design and Implementation Process. Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, Processes and Threads, Symmetric Multiprocessing(SMP), Microkernel, CPU Scheduler and Scheduling. Principles of Concurrency, Mutual Exclusion, Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writes Problem

### **UNIT – 2 DEADLOCKS AND MEMORY MANAGEMENT**

Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Process Creation, Page Replacement, Allocation of Frames.

### **UNIT – 3 DISTRIBUTED & REALTIME OPERATING SYSTEM**

Motivation, Features, Network Structure, Network Topology, Communication structure, communication protocols, Design issues, Notations of Time and State, States and Events, Time and Clocks and Event Precedence, Recording the State of Distributed System Kernel Architecture, Hardware model, Processor, Memory Map, peripherals, Interrupt Assignment, Data Bus Usage, Task Switching, Semaphores, semaphore construction and Destruction, Queues, channel numbers, Interrupt Processing. Introduction, Origin of NOS, Types of NOS and how they differ, NOS for LAN, support of NOS for API.

### **UNIT – 4 LEXICAL & SYNTAX ANALYSIS**

Lexical analysis: The Role of Lexical Analyzer, Input Buffering; Specifications of Tokens, Recognition of Tokens. Context-free Grammars, Writing a Grammar. Top-down Parsing, Bottom-up Parsing. Simple LR; More powerful LR parsers. Using ambiguous grammars, Parser Generators.

### **UNIT – 5 SYNTAX-DIRECTED TRANSLATIONS**

Evaluation orders for SDDs, Applications of syntax-directed translation, Intermediate Code Generation: Variants of syntax trees, Three-address code, Translation of expressions. Run-Time Environments, Storage Organization, Stack allocation of space, Access to non-local data on the stack, Heap management. Introduction to garbage collection, Code Generation, Issues in the design of Code Generator, The Target Language, Addresses in the target code, Basic blocks and Flow graphs, Optimization of basic blocks, A Simple Code Generator

## References

1. Silberschatz, Galvin, Gagne, "Operating System Concepts" John Wiley, Sixth Edition, 2004
2. Dhananjay M. Dhamdhere, "Operating Systems – A Concept – Based Approach", Tata McGraw – Hill, 2<sup>nd</sup> Edition, 2012.
3. William Stallings, "Operating Systems – Internals and Design Principles" Pearson, 6th edition, 2012
4. Dr. Jürgen Saurmann, Melannic Theleen "Concepts and Implementation for Embedded Systems".
5. Phillip Hunter "Network Operating Systems: Making the Right Choices", Addison Wesley Professional.
6. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition Pearson Education, 2007
7. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
8. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
9. Kenneth C Loudon: Compiler Construction Principles & Practice, Cengage Learning, 1997



## **14PHDMCA006: Advance Computer Network**

### **Unit 1: Review of fundamentals of wireless communication and networks:**

Wireless communication channel specifications, wireless communication systems, wireless networks, switching technology, communication problems, wireless network issues and standards

### **Unit 2 : Wireless Adhoc Networks:**

Mobile adhoc networks, Sensor networks, Mesh networks, VANETs. Research issues in wireless networks, AODV, DSR, DSDV routing. Wireless TCP: indirect TCP, Snooping TCP, Mobile TCP

### **Unit 3: Graph Theory**

Graphs, Matrices and Isomorphism, Decomposition and Special Graphs, Paths, Cycles, and Trails: Connection in Graphs, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting: Counting and Bijections, Extremal Problems, Graphics Sequences. Directed Graphs: Definitions and Examples, Vertex Degrees, Eulerian Digraphs, Orientations and Tournaments, Trees: Properties of Tree, Distance in Trees and Graphs, Spanning Trees in Graphs, Trees in Computer Science

### **Unit 4: Connectivity and Paths:**

Cuts and Connectivity: Connectivity, Edge-connectivity, Blocks, kconnected Graphs: 2-connected Graphs, Connectivity of Digraphs, k-connected and k-edgeconnected Graphs, Applications of Menger's Theorem, Network Flow Problems: Maximum Network Flow, Integral Flows, Supplies and Demands

### **Unit 5: Network Optimization:**

Network models, Minimal Spanning Trees, Shortest Route Problems, Matching and Coloring problem, Max flow – Min Cut Problem, Capacitated network model, Network Simplex Method, PERT and CPM, Resource Analysis in Network scheduling, Precedence Planning, Resource Allocation and scheduling

### **REFERENCE BOOKS:**

1. S.S. Manvi, M. S. Kakkasageri, “Wireles and Mobile Network concepts and protocols”, Wiley, First edition, 2010
2. P. Kaveh, Krishnamurthy, “Principles of wireless networks: Aunified approach”, PHI, 2006
3. Iti Saha Mishra, “Wireless communication and networks 3G and beyond “, MGH, 2009
4. Mullet, “Introduction to wireless telecommunication systems and networks”, Cengage, 2009.

5. D. P. Agarwal, Qing An Zeng, **“Introduction to wireless and mobile systems”**, Cengage, 2008
6. D. B. West, Introduction to Graph Theory, Prentice Hall of India, 2001
7. Harary F, New Directions in the Theory of Graphs, Academic Press, New York
8. C H Papadimitriou and K Stieglitz, Combinatorial Optimization : Algorithms and complexity, Prentice Hall, 1982
9. Hamdy A Taha, Operations Research, PHI, 1997

## **14PHDMCA007: Advanced Software Engineering**

**Unit 1: Modeling:** What is modeling? Object Oriented Thinking, History of UML Building Blocks of UML, OCL: what & why, expression syntax Introduction to OMG standards MDA, XMI, UML 2.0. RUP emphasizing Inception, Elaboration, Construction, Transition Phases. 4+1 architecture, UML Meta model, Extensibility mechanisms like stereotypes, tagged values, constraints and profiles. MDA, XMI, UML 2.0

**Unit 2: Requirements of modeling:** Gathering & classifying requirements, Requirements metamodel, Requirements workflow Detail Use case specifications, Use cases & RUP, Advanced use-case modeling, Activity diagrams. Review and interactive discussions on home tutorials, classroom tutorials and students presentation. Review of recent advances in the subject. Use-case modeling (actors, use cases, relationships),

**Unit 3: UML Diagrams:** Package diagrams, Basic Class diagrams, Need, purpose & application of UML diagrams, CRC method, Advanced Class diagrams, Object diagrams, Composite structure diagrams, Illustrations of Package diagrams, Basic Class diagrams, Object diagrams, Composite structure diagrams. Need, purpose & application of sequence diagrams, Communication diagrams, Interaction Overview diagrams, Timing Diagram, State Machine diagrams, component Diagram, Interfaces and ports, Deployment diagrams, Need, purpose & application of above diagrams two, three tier architecture,

**Unit 4: Concept of Forward Engineering and Reverse Engineering:** UML Diagrams, Design patterns, Forward Engineering and Reverse Engineering of all diagrams of UML 2.0. UML diagrams for following design patterns: Singleton, Abstract factory, Façade, proxy, Iterator, Observer. Design pattern examples

**Unit 5: Software Engineering and Design Patterns** – a generic view. Review of Software Development stages- analysis , design, implementation, testing .Program verification. Module relationship- Coupling, Cohesion. Effort Estimation models . Project Scheduling .Software Maintenance. Software Quality Models. Software Reliability –Basics, Time-dependent and Time-independent models. Software metric. Software Configuration management . Object- oriented software Engineering. Unified Modelling Languages – features and case study. Design Patterns: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Communication Patterns: Forwarder-Receiver; Master Slave; Whole-Part, Management Patterns: Command processor;

### **References**

1. Jim Arlow, IlaNeustadt "UML 2 and the Unified Process : Practical Object-Oriented Analysis and Design" (2nd Edition) (Pearson)
2. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.
3. Grady Booch, James Rumbaugh, Ivar Jacobson "Unified Modeling Language User Guide", The (2nd Edition) (Addison-Wesley Object Technology Series) (Hardcover)
4. Mike O'Docherty, —Object Oriented Analysis & Design, Wiley India

5. Object-Oriented Analysis and Design Using UML, An introduction to unified Process and design patterns, by Mantha Mahesh, PHI Publications, ISBN 978-81-203-3322-2.
6. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-OrientedSoftware Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006.

## **14PHDMCA008: Advance Database Management System**

### **Unit-1: NOSQL and Query Optimization**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MongoDB Basics: NOSQL Storage architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering data sets (MongoDB/CouchDB/Cassandra).Advanced NOSQL ,NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive. Working with NOSQL:, Query Optimization: Overview ,Transformation of Relational Expressions, Estimating Statistics of Expression Choice of Evaluation Plans, Materialized views Advanced Query Optimization: Motivation, Query Processing Phases, Logical Query Optimization.

### **Unit-2: SAN**

Unit1: Introduction to Information Storage and Management, Data Center Infrastructure, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance. Data Protection, Intelligent Storage system: Implementation of RAID, RAID Array Components, RAID Levels, RAID Impact on Disk Performance.

### **Unit-3: Data Warehousing and Data Mining**

A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Frequent Patterns and Associations: Mining Methods, Mining Various Kinds of Association Rules. Classification and Prediction: classification by decision tree induction, Bayesian classification, Rule based classification, Prediction, Accuracy and Error Measures. Cluster Analysis: 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, Outlier analysis. Applications and Trends in Data Mining: Data Mining Applications, Social Network Analysis;

### **Unit-4: Big Data**

Introduction to principles and practice of systems that improve performance through experience. Topics include statistical learning framework, supervised and unsupervised learning, performance evaluation and empirical methodology; design tradeoffs. Introduction to the Big Data problem. Current challenges, trends, and applications Algorithms for Big Data analysis. Mining and learning algorithms that have been developed specifically to deal with large datasets Technologies for Big Data management. Big Data technology and tools, special consideration made to the Map-Reduce paradigm and the Hadoop ecosystem.

### **Unit-5: Information Retrieval and Search Engines**

Architecture of search engine, Ranking and Evaluation; CRAWLS AND FEEDS: Crawling the Web, Directory Crawling, Conversion Problem, Storing the Documents, Detecting Duplicates.

Processing text: Text Statistics, Document Parsing, Document Structure and Markup, Link Analysis, Information Extraction, Internationalization; RANKING WITH INDEXES: Inverted indexes, Compression, Entropy and Ambiguity, Delta Encoding, Bit-aligned codes, Auxiliary Structures, Index Construction, Query Processing; QUERIES AND INTERFACES: RETRIEVAL MODELS: The Vector Space Model, Probabilistic Models, Information Retrieval as Classification, BM25 Ranking Algorithm, Complex Queries and Combining Evidence, Web Search; EVALUATING SEARCH ENGINES: The Evaluation Corpus, Logging, Effectiveness Metrics, Recall and Precision Averaging and Interpolation.

## References

1. "Professional NOSQL" by Shashank Tiwari, 2011, WROX Press The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, by Eelco Plugge, Tim Hawkins, Peter Membrey Apress 2010
2. "NoSQL Handbook" by Mathias Meyer, 2011 Paperplanes.
3. MongoDB: The Definitive Guide, 2nd Edition, by Kristina Chodorow 2013 Silberschatz, Korth and Sudharshan Andreas Meister Otto-von-Guericke University Magdeburg
4. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management: Storing, Managing & Protecting Digital Information in Classic, Visualized and Cloud Environments, 2<sup>nd</sup> edition, EMC Education Services, Wiley- India, 2009. ISBN 978-1-1180-9483-9
5. Jiawei Han and Micheline Kamber, Data Mining, Concepts and Techniques, Morgan Kaufmann Publisher, II Edition, 2006.
6. Machine Learning, Tom Mitchell. ISBN-10: 0070428077 | ISBN-13: 978-0070428072 | Edition: 1 (optional)
7. Hadoop Real World Solutions Cookbook by Jonathan R. Owens, Brian Femiano, and Jon Lentz Publication Date: February 7, 2013 | ISBN-10: 1849519129 | ISBN-13: 978-1849519120
8. Search Engines: Information Retrieval in Practice: Trevor Strohman, Bruce Croft Donald Metzler, Kindle Edition

## **14PHDMCA009: Computer Graphics & Visualization**

**UNIT – 1 INTRODUCTION:** Graphics architectures, Programmable pipelines, Performance characteristics. Graphics Programming, The Sierpinski gasket, The OpenGL API, Primitives and attributes, Color, Viewing, Control functions. The Gasket program, Polygons and recursion, The three-dimensional gasket, Plotting implicit functions.

### **UNIT - 2 GEOMETRIC OBJECTS AND TRANSFORMATIONS**

Interaction input devices, Clients and servers, Display lists and modeling; Programming event-driven input, Menus, Animating interactive programs. Design of interactive programs, Logic operations. Scalars, points, and vectors, Three-dimensional primitives, Coordinate systems and frames, Modeling a colored cube, Affine transformations, Rotation, translation and scaling.

Interactive Computing: Data Visualization in 2D and 3D plotting techniques with Animation

### **UNIT - 3 VIEWING & LIGHTING AND SHADING**

Projections in OpenGL, Hidden-surface removal, Interactive mesh displays, Parallel-projection matrices. Perspective-projection matrices, Projections and shadows. Light and matter, Light sources. The Phong lighting model, Computation of vectors, Polygonal shading, Light sources in OpenGL.

### **UNIT – 4 FUNDAMENTAL CONCEPTS IN TEXT AND IMAGE**

Fundamental Concepts in Video and Digital Audio, Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio. Action Script Features, Object-Oriented Action Script, Data types and Type Checking, Classes, Authoring an Action Script Class.

### **UNIT – 5 MULTIMEDIA DATA COMPRESSION**

Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding, Embedded Zerotree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT).

Basic Video Compression Techniques: Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG, Basic Audio Compression Techniques.

Multimedia Networks: Basics of Multimedia Networks, Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD).

#### **References:**

1. Interactive Computer Graphics A Top-Down Approach with OpenGL -Edward Angel, 5th Edition, Addison-Wesley, 2008.
2. Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002

3. Computer Graphics Using OpenGL – F.S. Hill,Jr. 2nd Edition, Pearson Education, 2001.
4. Computer Graphics – James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Addison-wesley 1997.
5. Computer Graphics - OpenGL Version – Donald Hearn and Pauline Baker, 2nd Edition, Pearson Education, 2003.
6. Multimedia Information Networking, Nalin K. Sharda, PHI, 2003.
7. “Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing”, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
8. “Multimedia Systems Design”, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.
9. "Pro Data Visualization using R and JavaScript" , Tom Barker, APRESS, 2013
10. "Learning IPython for Interactive Computing and Data Visualization", Cyrille Rossant, PACKT Publishing, April 2014,



## **14PHDMCA010: Advanced Algorithms**

### **Unit 1: Introduction**

Euclid's algorithm, Problem, Asymptotic complexity, Some stylistic issues, Analysis of Algorithms, Principles of Algorithm Design, Finding Maximum and Minimum, the master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

### **Unit 2: Divide and conquer**

Introduction, Median Finding, Surfing Lower Bounds, Closest Pair and Closest Hull Problem

### **Unit 3: Dynamic Programming**

Combinatorial Search:

Dynamic programming: Knapsack, Longest common subsequence, Matrix chain multiplication or Optimal search trees, A machine scheduling problem

**Unit 4: Greedy and Graph Algorithms:** Introduction, Set of Intervals, Fractional Knapsack, Huffman Coding, Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; maximum bipartite matching. Balanced search trees: AVL trees and/or 2-3 trees and/or splay trees with garbage collection, Red-Black Trees

### **Unit 5: NP-Completeness and Limitations of Algorithm Power**

Matching, Introduction to NP-Complete, Search/Decision, SAT, Independent Set 3VC, Exact Cover, Multi Set, Subset Sum & Partition, Hamiltonian Circuit, Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems, Approximation Algorithms

## **References**

1. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothia publications.
2. Introduction to the design and analysis of Algorithms, Anany Levitin : Pearson Education,
3. Design and Analysis of Algorithms, P. Dave, H. Dave, Pearson Education, 2008.
4. Introduction to Algorithms, Cormen, Leiserson and Rivest : Prentice Hall of India.
5. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.