CH. CHARAN SINGH UNIVERSITY, MEERUT

Syllabus

For

Third Year

(Master of Computer Applications)

(Effective from the Session: 2018-19)

Master of Computer Applications 2018-19

FIFTH SEMESTER

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-511	Computer Graphics & Animation	3	1	0	20	10	30	70	100	04
2.	MCA-512	Software Engineering	3	1	0	20	10	30	70	100	04
3.	MCA-Elective-II	Elective – II	3	1	0	20	10	30	70	100	04
4.	MCA-Elective-III	Elective – III	3	1	0	20	10	30	70	100	04
5.	MCA-Elective-IV	Elective – IV	3	1	0	20	10	30	70	100	0
6	MCA-551	Computer Graphics & Animation Lab	0	0	6	30	20	50	50	100	03
7.	MCA-552	Project Based on Software Engineering	0	0	3	30	20	50	50	100	02
		Total	15	5	9					700	24

SIXTH SEMESTER

Sl. No.	Subject Code	Subject Name	Period			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Total	
						CT	TA	Total			
1	MCA-611	Colloquium	0	0	8	-	100	100	-	100	04
2	MCA-6I2	Project	0	0	40	-	250	250	350	600	20
		Total	0	0	48					700	24

MCA V Semester Electives

Elective : II

1. MCA-E21 : Cryptography and Network Security
2. MCA-E22 : Natural language Processing
3. MCA-E23 : Human Computer Interaction
4. MCA-E24 : Software Testing
5. MCA-E25 : Modern Application Development

Elective: III

1. MCA-E31 : Cloud Computing
2. MCA-E32 : Soft Computing
3. MCA-E33 : Information Storage Management
4. MCA-E34 : Digital Image Processing
5. MCA-E35 : Distributed Systems

Elective : IV

1. MCA-E41 : Distributed Database Systems
2. MCA-E42 : Simulation and Modeling
3. MCA-E43 : Real Time Systems
4. MCA-E44 : Pattern Recognition
5. MCA-E45 : Big Data

MCA-511 Computer Graphics and Animation

UNIT-I: **(8)**

Introduction to Computer Graphics: What is Computer Graphics, Computer Graphics Applications, Computer Graphics Hardware and software, two-dimensional Graphics Primitives: Points and Lines, Line drawing algorithms: DDA, Bresenham's Circle drawing algorithms: Using polar coordinates, Bresenham's circle drawing, mid-point circle drawing algorithm; Filled area algorithms: Scan line: Polygon filling algorithm, boundary filled algorithm.

UNIT-II: **(8)**

Two/Three-Dimensional Viewing: The 2-D viewing pipeline, windows, viewports, window to view port mapping; Clipping: point, clipping line (algorithms): - 4-bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping algorithm. Two dimensional transformations: transformations, translation, scaling, rotation, reflection, composite transformation. Three dimensional transformations: Three-dimensional graphics concept, Matrix representation of 3 D Transformations, Composition of 3-D transformation.

UNIT-III: **(8)**

Viewing in 3D: Projections, types of projections, mathematics of planner geometric projections, coordinate systems. Hidden surface removal: Introduction to hidden surface removal. Z- buffer algorithm, scanline algorithm, area sub- division algorithm.

UNIT-IV: **(8)**

Representing Curves and Surfaces: Parametric representation of curves: Bezier curves, B-Spline curves. Parametric representation of surfaces; Interpolation method.

Illumination, shading, image manipulation: Illumination models, shading models for polygons, shadows, transparency. What is an image? Filtering, image processing, geometric transformation of images.

UNIT- V: **(8)**

Animation; Fundamentals of computer animation, Animation Techniques. Animation and Flash Overview, Using Layer and Creating Animation

REFRENCES:

1. Procedural Elements for Computer Graphics – David F. Rogers, 2001, T.M.H Second Edition.
2. Fundamentals of 3Dimensional Computer Graphics by Alan Watt, 1999, Addision Wesley.
3. Computer Graphics: Secrets and Solutions by Corrign John, BPB
4. M.C. Trivedi, NN Jani, Computer Graphics, Jaico Publications
5. Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
6. Graphics, GUI, Games & Multimedia Projects in C by Pilania&Mahendra, Standard Publ.
7. Computer Graphics Secrets and solutions by Corrign John, 1994, BPV
8. Principles of Multimedia by Ranjan Parekh, McGrawHill Education
9. Computer Graphics Principles and Practices second edition by James D. Foley, Andeies van Dam, StevanK. Feiner and Johb F. Hughes, 2000, Addision Wesley.
10. Computer Graphics by Donald Hearn and M.Pauline Baker, 2nd Edition, 1999, PHI
11. Computer graphics, Multimedia and Animation by Malay. K.Pakhira, PHI, 2nd Edition, 2010

MCA-512 Software Engineering

UNIT-I: **(8)**

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT-II: **(8)**

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance :(SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT-III:

Software Design: **(8)**

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs

UNIT-IV: **(8)**

Software Testing: Testing Objectives, UNIT Testing, Integration Testing, 8 Acceptance Testing, Regression Testing, Testing for functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT-V: **(8)**

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource allocation Models, Software Risk Analysis and Management.

REFRENCES:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Deepak Jain," Software Engineering: Principles and Practices",Oxford University Press.
6. Munesh C. Trivedi, Software Engineering, Khanna Publishing House
7. N.S. Gill, Software Engineering, Khanna Publishing House

MCA-E21: Cryptography and Network Security

UNIT-I **(8)**

Introduction: to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

UNIT-II **(8)**

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

UNIT-III **(8)**

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

UNIT-IV **(8)**

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security- pretty good privacy (PGP), S/MIME.

UNIT-V **(8)**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted
systems.

REFRENCES

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6. Bernard Menezes," Network Security and Cryptography", Cengage Learning. 6. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

MCA-E22 : Natural language Processing

UNIT-I **(8)**

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

UNIT-II **(8)**

Introduction to semantics and knowledge representation, some applications like machine translation, database interface.

UNIT-III **(8)**

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

UNIT-IV **(8)**

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

UNIT-V **(8)**

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

REFRENCES:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

MCA-E23: Human Computer Interaction

UNIT-1 **(8)**

Introduction: Importance of user Interface – definition, importance of 8 good designs. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface

UNIT-II **(8)**

Design process – Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT-III **(8)**

Screen Designing : Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT-IV **(8)**

Windows: New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT-V **(8)**

Software tools: Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

REFRENCES;

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

MCA-E24: Software Testing

UNIT-I **(8)**

Review of Software Engineering: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing All Paths. Verification: Verification methods, SRS verification, Source code reviews, User documentation verification, and Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

UNIT–II **(8)**

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

UNIT-III **(8)**

Regression Testing: What is Regression Testing? Regression Test cases selection, reducing the number of test cases, Code coverage prioritization technique. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis.

UNIT-IV **(8)**

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and their Applicability, Exploratory Testing Automated Test Data Generation: Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

UNIT-V **98)**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.

REFRENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal &Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van Nostrand Reinhold, New York, 1984.

MCA-E25: Modern Application Development

UNIT-I **(8)**

Introduction: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT-II **(8)**

Basic design: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT-III **98)**

Advanced design: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT-IV **(8)**

Technology in android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-fi – Integration with social media applications.

UNIT-V **(8)**

TECHNOLOGY II – IOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift features of swift.

REFRENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
6 Development: Exploring the iOS SDK”, Apress, 2013.

MCAE-31 Cloud Computing

UNIT-I **(8)**

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

UNIT-II **(8)**

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT-III **(8)**

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT-IV **(8)**

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vim, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

UNIT-V **(8)**

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

REFRENCES:

1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974
6. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
7. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
8. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

MCA-E32 Soft Computing

UNIT-I **(8)**

Artificial neural networks: Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

UNIT-II **(8)**

Fuzzy systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III **(8)**

Neuro - fuzzy modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation.

UNIT-IV **(8)**

Genetic algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction – Rank method - Rank space method.

UNIT-V **(8)**

Application of soft computing: Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm-based Internet Search Techniques, Soft computing-based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

REFRENCES:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

MCA-E33 Information Storage Management

UNIT-I **(8)**

Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

UNIT-II **(8)**

Storage Systems Architecture; Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

UNIT-III **(8);**

Introduction to Networked Storage: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options,
connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity
options, standards, and management principles, Hybrid Storage solutions overview including technologies like
virtualization & appliances.

UNIT-IV **(8)**

Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

UNIT-V **(8)**

Managing & Monitoring: Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

REFRENCES:

1. Information Storage and Management Storing, Managing, and Protecting Digital Information, by EMC, Hopkinton and Massachusetts, Wiley, **ISBN:** 97881265214
2. Information storage and management: storing, managing, and protecting digital information by Wiley Pub G Somasundaram, Alok Shrivastava
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002
4. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.
5. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne. 2001.

MCA-E34 Digital Image Processing

UNIT-I **(8)**

Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering in
Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian
High pass Filters; Homomorphic Filtering.

UNIT-II **(8)**

Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III **(8)**

Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise Only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **(8)**

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V **(8)**

Registration:
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level thareholding, Local thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by thareholding, Edge Detector Performance, Line Detection, Corner Detection.

REFRENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Digital Image Processing, Munesh C. Trivedi, Sanjay M. Shah, Khanna Publishing House

MCA-E35 Distributed Systems

UNIT–I **(8)**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks; Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

UNIT-II **(8)**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non-token-based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT–III **(8)**

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory**.**

UNIT–IV **(8)**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

UNIT–V **(8)**

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

REFRENCES:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Distributed System, Munesh C. Trivedi, Khanna Publishing House
5. Tenanuanbaum, Steen," Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

MCA-E41 Distributed Database System

UNIT-I **(8)**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascade less schedules.

UNIT–II **(8)**

Lock based protocols, time stamp-based protocols, Multiple Granularity and Multi version Techniques, enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT-III **(8)**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT–IV **(8)**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT-V **(8)**

Distributed Query Processing, Multiday Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

REFRENCES:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Distributed System, Munesh C. Trivedi, Khanna Publishing House
6. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

MCA-E42 Simulation and Modelling

UNIT-1 **(8)**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

UNIT-II **(8)**

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

UNIT-III **(8)**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

UNIT-IV **(8)**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams, Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

UNIT-V **(8)**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression-based languages, object-oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

REFRENCES:

1. Geoftrey Gordon, “System Simulation”, PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education
3. V P Singh, “System Modeling and simulation”, New Age International.
4. Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”, TMH

MCA-E43 Real Time Systems

UNIT-I **(8)**

Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, precedence constraints and Data Dependency.

UNIT-II **(8)**

Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round
Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III **(8)**

Resources Sharing: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Pre-emption Ceiling Protocol, Access Control in Multiple-UNIT Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV **(8)**

Real Time Communication: Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V **(8)**

Real Time Operating Systems and Databases: Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

REFRENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, “Real Time Systems”, Pearson Education
3. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

MCA-E44 Pattern Recognition

UNIT-1 **(8)**

Introduction: 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.

UNIT-II **(8)**

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

UNIT-III: **(8)**

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

UNIT-IV: **(8)**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

UNIT-V: **(8)**

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitioned clustering – K means, agglomerative hierarchical clustering, Cluster validation.

REFRENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

MCA-E45 Big Data

UNIT-I **(8)**

Understanding big data: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data ,credit risk management, big data and algorithmic trading, big data and HealthCare, big data in medicine, advertising and big data, big data technologies, Introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing Analytics ,inter and trans firewall analytics

UNIT-II **(8)**

NoSQL data management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models ,sharing , masters slave replication , peer-peer replication , sharing and replication , consistency , relaxing consistency , version stamps , map reduce , partitioning and combining , composing map-reduce calculations

UNIT-III **(8)**

Basics of Hadoop; Data format, analyzing data with Hadoop, scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , oppression ,serialization , Avro file-based data structures

UNIT-IV **(8)**

Map reduce applications; Map Reduce workflows, UNIT tests with MR UNIT, test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats

UNIT-V **(8)**

Hadoop related tools; HBase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra, cassandra data model, cassandra examples ,cassandra clients , Hadoop integration.Pig , Grunt , pig data model , Pig Latin , developing and testing PigLatin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation – HiveQL queries

REFRENCES:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
3. Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
7. V.K. Jain, Big Data & Hadoop, Khanna Publishing House
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

MCA-511 Computer Graphics and Animation Lab

LIST OF EXPERINETNS

(1) Digital differential Analyzer
(2) Line Drawing Algorithms
(3) Mid-point Circle Generation Algorithm
(4) Creating two-Dimensional Objects
(5) Two-dimensional Transformation
(6) Picture Coloring
(7) Three-Dimensional transformation
(8) Simple Animation using Transformation
(9) Key-Frame Animation
(10) Design Animation using FLASH

Note: Lab can be conducted in "C" language / Virtual Labs /Open GL.

MCA-512 Project Based on Software Engineering

Students are expected to analyse the problem Statement/ case study and design a solution applying software engineering principles