

# 1MIT1 COMPUTER GRAPHICS AND IMAGE PROCESSING

## Review of Graphics Fundamentals

Basic raster graphical algorithm for 2D primitives, Line drawing algorithm, 2D and 3D transformations; Window, Viewport, Clipping algorithm; Circle drawing algorithm, Ellipse drawing algorithm, Bezier curve, b-spline curve, surfaces and Solid modeling. Parallel projection, Perspective projection and Computation of vanishing point; Z-buffer algorithm, Scan line algorithm. Area subdivision and Ray tracing algorithms

## Shading

Illumination mode, Specular reflection model, Shading models for curve surfaces, Radiosity method, Rendering, Recursive ray tracing, Texture mapping

## Image Manipulation & Storage

What is an Image, Elementary Image processing techniques; Multipass transformation, Image Compositing.

## Advanced Modeling Techniques

Procedural Models, Fractal Models, Grammar based models, particle systems, Volume rendering.

## Segmentation in 2D

Greedy and Local Methods – Watersheds and minimum spanning trees  
Deformable Methods – Intelligent scissors/ livewires, active contours; DP snakes, region and boundary methods

## Image Reconstruction

Anisotropic reconstruction, restoration, noise removal, high dynamic & range imaging and inpainting

## Animation

3D animation, morphing and simulation of key frames

## Reference:

1. Hearn & Baker, "Computer Graphics C version", 2<sup>nd</sup> ed. Pearson Education.
2. Woo-Open, "GL Programming Language" version 1.2, 3<sup>rd</sup> edition Pearson Education.
3. Hill, "Computer Graphics using open GL", 2<sup>nd</sup> edition Pearson Education.
4. Roger and Adams, "Mathematical Element for Computer Graphics", 2<sup>nd</sup> ed., Tata McGraw Hill.
5. Rogers, "Procedural Element for Computer Graphics", 2<sup>nd</sup> ed, Tata McGraw Hill.
6. Milan Sonka and Vaclav, "Image Processing, Analysis and Machine Vision", 3<sup>rd</sup> Ed (2007) Thomson Learning.

## **1MIT2 OBJECT ORIENTED SOFTWARE ENGINEERING**

### **Introduction to Software Engineering**

Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models

### **Object Methodology & Requirement Elicitation**

Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirement, Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation

### **Architecture**

Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model

### **Modeling with UML**

Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams

### **System Analysis**

Analysis Model, Dynamic Modeling & Testing

### **System Design**

Design concepts & activities, Design models, Block design, Testing

### **Testing Object Oriented Systems**

Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing

### **Reference:**

1. Stephen R. Scach, "Classical & Object Oriented Software Engineering with UML and Java", McGraw Hill, 1999.

## **1MIT3 WIRELESS COMMUNICATION TECHNOLOGIES**

### **Overview of Third Generation (3G) in wireless**

Universal Mobile Telecommunication Service (UMTS), UMTS Service and Air interface, 3GPP network architectures, CDMA2000, TD-CDMA and TD-SCDMA Technologies.

### **Evolution of 2.5G**

Enhancement over 2G, GPRS and EDGE network services and architectures, traffic dimensioning, CDMA2000 (1XRTT), WAP and SMS, migration path from 2G to 2.5G to 3G

### **UMTS**

UMTS basics, WCDMA interface, UTRAN architecture, establishment of UMTS speech cells, UMTS packet data (R99), High speed packet data handover and UMTS core network evolution

### **CDMA 2000**

Radio components, Network structure packet data transport flow, Radio network (IS-2000 1XRTT), EVDO.

### **TD-SCDMA**

Architecture and code network, Radio network, Interface Migration Technique RAN Traffic planning.

### **TD-CDMA**

Generic TD-CDMA architecture, code networks, Radio Network, Interface migration technique RAN traffic planning.

### **VoIP Technology**

Basis of IP transport, VoIP challenges, H-323, session invitation protocol, distributed architecture & media gateway control, VoIP and SS7 VoIP quality of service.

### **Broadband**

Wifi 802.11, 802.16, bluetooth and cable system

### **Antenna System Selection**

Base Station antenna, performance criteria, Diversity, cross pole antenna, dual band antenna dBi and dBd

### **References:**

1. Smith & Collins, "3G Wireless Networks", TMH, 2007.
2. Theodore S. Rappaport, "Wireless Communication- Principles and practices," 2nd Ed., Pearson Education Pvt. Ltd, 2003.

## **1MIT4.1 CLUSTER AND GRID COMPUTING**

### **Cluster Computing**

Parallel systems, Cluster Architecture, Parallel Paradigms, Parallel, Programming with MPI, Resource management and scheduling.

### **Grid Computing**

Grids and Grid Technologies, Programming models and Parallelization Techniques, Standard application development tools and paradigms such as message-passing and parameter parallel programming, Grid Security Infrastructure, Data Management.

### **Application Case Study**

Molecular Modeling for Drug Design and Brain Activity Analysis, Resource management and scheduling, Setting up Grid, deployment of Grid software and tools and application execution.

### **References:**

1. Buyya (editor), "High Performance Cluster Computing" , Vol1. and Vol.2, Prentice Hall, USA, 1999.
2. Foster and C. Kesselman (editors), "The Grid: Blueprint for a New Computing Infrastructure" , Morgan Kaufmann Publishers , 1999.
3. R. Buyya, "Economic-based Distributed Resource Management and Scheduling for Grid Computing", Ph.D. Thesis, Monash University, Melbourne, Australia, April 2002.
4. Gaig Fallenstein, "Grid Computing"
5. Ahmad Abbas, "Grid Computing : A practical guide to technology and applications".

## **1MIT4.2 ERROR CONTROL CODING**

Coding for Reliable Digital Transmission and Storage, Introduction to Algebra, Linear Block Codes, Important Linear Block Codes, Cyclic Codes, Binary BCH Codes, Reed-Solomon Codes, Decoding Algorithms, Trellises for Linear Block Codes, Reliability-Based Soft-Decision Decoding Algorithms for Linear Block Codes, Convolutional Codes, Turbo Coding and codes for Burst-Error-Correcting.

### **References:**

1. Davis, Daniel J. Costello, "Error Control Coding", 2/E, Shu Lin, University of California, Notre Dame University, ISBN-10: 0130426725, ISBN-13: 9780130426727, Prentice Hall, 2005.
2. Richard B. Wells, "Applied Coding and Information Theory for Engineers", University of Idaho, ISBN-10: 0139613277, ISBN-13: 9780139613272, Publisher: Prentice Hall, 1999.

## **1MIT4.3 DESIGN PATTERNS**

### **Introduction**

Patterns in software engineering, definition and evolution, identifying patterns, representation, reflection, usage, refactoring and anti pattern.

### **J2EE & Design Pattern**

Sum Java center J2EE patterns catalog, presentation Tier design considerations and Practices, Business Tier design considerations and Practices.

### **J2EE Refactoring**

Presentation Tier Refactoring, Business and Integration Tier Refactoring, General refactoring.

### **Server side.com patterns**

catalog, patterns applied to the web tier, patterns applied to a persistence framework, patterns to improve performance, seal ability and security, pattern for enterprise integration, patterns applied to enable reusability, maintainability & extensibility.

### **VB .NET & Design Pattern**

Patterns in the Data Tier, Middle Tier, Presentation Tier, .NET remoting.

### **References:**

1. E. Gamma et. al., "Design Pattern, Elements of reusable object oriented software", AWL
2. C. A. Berry et. al., "J2EE design patterns applied", Wror/Spd, 2000
3. Deepak Alur, John Crupi, Dan Malks, "Core J2EE Patterns ", Pearsons Educations
4. T. Fischer, "Design patterns in VB .NET", Wrox/Spd, 2002

## **2MIT1 ADVANCED COMPUTER NETWORKS**

### **Networks, Queues and Performance Modeling**

Introduction, Network types, Multiple-access protocols, Discrete-time queues, Performance measures

### **Probability, Random Variables and Distributions**

Probability, Random variables, Distributions and Conditional distributions

### **Stochastic Process and Markov Chains**

Poisson process and its properties, Markov chains and Markov chain models.

### **Discrete-Time Queues**

Performance measures and Little's result, Discrete-time queuing conventions, Discrete-time  $M/M/1$  queue, Discrete-time  $M/M/1/J$  queue, Discrete-time  $M^{an}/M/1$ , Discrete-time  $M^{an}/M^{dm}/\infty$  queue, S-queues

### **Discrete-Time Queuing Networks**

Tandem S-queues, Network of S-queues, Discrete-time queuing network models for multiple access protocols, Equilibrium point analysis, Different customer classes.

### **Satellite Networks**

Time-division multiple access, Slotted Aloha, Code division multiple access, Buffered slotted Aloha

### **Local Area Networks**

Carrier sensing networks, Token passing networks, Slotted rings.

### **References:**

1. Woodward, M. E., "Communication and Computer Networks: Modeling with discrete-time queues", Systems Publication Date: January 1994, Wiley-IEEE Computer Society Pr, ISBN: 0818651725.

## **2MIT2 ENTERPRISE COMPUTING IN JAVA**

### **J2EE**

Introduction to J2EE, Building J2EE Applications, JDBC, Servlets and Web Applications, Java Server Pages and Model/View/Controller, J2EE Web Services Overview, Introduction to EJB, Session EJBs, Entity EJBs, JMS and message driven Beans, Transactions and Security, Application Servers (Case Study of any one of IBM Websphere, BEA Weblogic, JBoss) .

### **Hibernate**

Principles of Object Relational Mapping, Hibernate configuration, HQL, making objects persistent, Hibernate semantics, Session management, flushing, concurrency and Hibernate, Optimistic and Pessimistic Locking and Object mapping Mapping simple properties, Single and multi valued associations, Bi-directional associations, Indexed collections, Using Hibernate Template, Querying, Session management, Transaction integration and demarcation.

### **Spring**

Introduction of Spring Framework, Spring Architecture, Spring Framework definition, Spring & MVC, Factory Pattern, Bean Factory, Spring Context definition, Inversion of Control (IoC), Spring AOP, Application Context and Bean Factory, Spring ORM, Mapping API for JDO, Hibernate, Hibernate Mapping, JDO Mapping, iBATIS, Spring Abstract Transaction layer, Employing Spring transaction, Using EJB declarative transactions, Integration process, integrating Spring MVC in web application, MVC in web application and MVC Framework.

### **Web Services**

Introduction to XML, Service-Oriented Architectures SOAP, SOAP message structure, handling errors WSDL, UDDI, Java Web Service implementations JAX-RPC, Web service clients in Java and Introduction to Ajax.

### **Reference:**

1. Jim Farley, William Crawford, O'Reilly and Associates, "Java Enterprise in a Nutshell", 2005.
2. Brett McLaughlin, O'Reilly, "Java and XML, 2nd Edition, 2001.
3. Elliott Rusty Harold and W. Scott Means, O'Reilly, "XML in a Nutshell", 2001.
4. James Cooper, "Java Design Pattern: A Tutorial", Addison Wesley.
5. Govind Sesadri, "Enterprise java Computing: Application and Architectures", Cambridge University Publications, 1999.



## **2MIT3 ADVANCED DBMS**

### **Review of traditional DBMS's**

Relational algebra and relational calculus, design principles, normalization, transaction and concurrency control, recovery management.

### **Design Process**

Design process, design evaluation, modeling process, E-R model, semantic data model, object oriented model, models and mapping normalization and denormalization. Data warehousing, OLAP and data mining.

### **Architecture**

Architecture of DB2, SQL server and Oracle. DB2 sever tuning, SQL server tuning, Oracle server tuning, OS tuning (Microsoft OS's)

### **Distributed Database Management Systems**

Components, levels of data & process distribution, transparency features, data fragmentation, data replication.

### **Client Server Systems**

Principles, components, ODBC, ADO, JDBC and JSQL overview.

### **Reference:**

1. J L Warrington, "Object Oriented Database Design", Morgan Kaufman.
2. T J Tewrey, "Database Modeling and Design", Morgan Kaufman.
3. DB2, "Oracle & SQL Server Documentation".

## **2MIT4.1 SOFTWARE TESTING**

### **Introduction**

Need for software testing, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

### **Functional Testing**

Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

### **Structural Testing**

Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

### **Reducing the number of test cases**

Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, Slice based testing

### **Testing Activities**

Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

### **Object Oriented Testing**

Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

### **Testing Tools**

Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools.

### **Reference:**

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
3. Boris Beizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, "Software Testing", Pearson Education Asia, 2002.
5. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, "Black-Box Testing – Techniques for Functional Testing of Software and Systems", John Wiley & Sons Inc., New York, 1995.
7. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
8. Gordon Schulmeyer, "Zero Defect Software", McGraw-Hill, New York, 1990.
9. Watts Humphrey, "Managing the Software Process", Addison Wesley Pub. Co. Inc., Massachusetts, 1989.
10. Glenford Myers, "The Art of Software Testing", John Wiley & Sons Inc., New York, 1979.

## **2MIT4.2 EMBEDDED SYSTEMS DESIGN**

### **Introduction**

Embedded systems overview, Design challenge - optimizing design metrics, Common design metrics, time-to-market design metric, NRE and unit cost design metric, performance design metric,

### **Processor Technology**

General-purpose processors - software, Single-purpose processors – hardware, Application-specific processors

IC technology - Full-custom/VLSI, Semi-custom ASIC, PLD, Trends

Design Technology - Compilation/Synthesis, Libraries/IP, Test/Verification

Tradeoffs - Design productivity gap

### **Custom Single-Purpose Processors Hardware**

Combinational Logic, Transistors and logic gates, Basic combinational logic design, RT-level combinational components

### **Sequential Logic**

Flip-flops, RT-level sequential components, Sequential logic design,

Custom single-purpose processor design, RT-level custom single-purpose processor design -Optimizing original program, FSM, datapath and FSM

### **General-purpose processors: Software**

Basic architecture - Datapath, Control unit, Memory

Operation - Instruction execution, Pipelining, Superscalar and VLIW architectures,

Programmer's view - Instruction set, Program and data memory space, Registers, I/O and Interrupts

Operating Systems and Development environment - Design flow and tools, Testing and debugging

### **Application-specific instruction-set processors (ASIP's)**

Microcontrollers, Digital signal processors (DSP), Less-general ASIP environments, Selecting a microprocessor, General-purpose processor design

### **Memory**

Memory write ability vs storage permanence, Common memory types - ROM, Mask-programmed ROM,

OTP ROM - one-time programmable ROM, EPROM, EEPROM and Flash memory

RAM - SRAM - Static RAM, DRAM - Dynamic RAM, PSRAM - Pseudo-static RAM,

NVRAM - Non-volatile RAM,

### **Interfacing**

Communication terminology and protocol concepts, Microprocessor interfacing - I/O addressing,

Port and bus-based I/O, interfacing interrupts and Direct memory access

Arbitration - Priority arbiter, Daisy-chain arbitration, Networked-oriented arbitration methods.

### **Digital camera example**

Introduction to Digital camera - User's perspective and Designer's perspective

Specification - Informal functional specification, Non-functional specification, Executable specification

Design - Implementation 1: 8051-based design, Implementation 2: fixed point FDCT, Implementation 3: hardware FDCT

### **Reuse**

intellectual property cores

Hard, soft and firm cores, New challenges posed by cores to processor providers as well as by cores to processor users

### **References:**

1. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley & Sons, Inc.
2. Michael Barr, O'reilly, "Programming Embedded Systems".
3. Peter Marwedel, Kluwer, "Embedded System Design" Academic Pub.

## **2MIT4.3 WIRELESS NETWORKS**

### **Introduction to Wireless Sensor Networks (WSN)**

Types of applications, challenges for WSN, Enabling Technologies for WSN

### **Single Node Architecture of WSN**

Hardware Component, Energy Consumption issues, operating system and execution environment, case study – Tiny OS and nisc, example nodes – Mica Mote, Eyes nodes

### **Network Architecture**

Sensor Network Scenarios – Single hop vs multi hop networks, multiple sinks and sources, optimization goals and figure of merit. Design Principles of WSN, Service interface of WSN, Gateway concept

### **Localization & Positioning**

Properties of localization and positioning procedures and approaches, mathematical basis for lateral problems, single loop localization, positioning in multi-hop environment

### **Topology Control**

Motivation and basic idea, controlling topology in flat networks, hierarchical networks by domain set hierarchical network by clustering

### **Routing Protocols**

Many faces of forwarding & routing, gossiping and agent based multi casting energy efficient market, broadcast & multicast geographical routing, mobile nodes

Data Centric and content based networking, Data Centric routing and Data aggregation

### **References:**

1. Holger Karl and Andress Wiling, “Protocols and Architectures for wireless Sensor Networks”, Wiley Eastern Press.
2. Yi –Bing Lin , “Wireless and mobile Networks Architecture,” John Wiley & Sons, 2001.
3. Singhal & Bridgman, “The Wireless Application Protocol,” Pearson Education, 2004.
4. Hensmann, Merk, & Stober, “Principles of Mobile Computing,” 2nd Ed., Springer International Edition, 2003.
5. Smith & Collins, “3G Wireless Networks,” TMH, 2007.
6. Siva Ram Murthy ,B.S. Manaj – Adhoc Wireless Networks : Architecture & Protocols , PH 2004,ISBN: 013147023X,9780131470231

## **3MIT1 MULTIMEDIA TECHNOLOGY**

### **Introduction**

Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation

### **Components of multimedia**

Text, Graphics, Audio, Video and their representation

### **Design & Authoring Tools**

Categories of Authority Tools, Types of products

### **Animation**

Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation

### **Animating Tool**

Fundamentals of MAYA, Modeling- NURBS, Polygon, Organic, animation, paths & boxes, deformers, Working with MEL - Basics & Programming

### **Rendering & Special Effects**

Shading & Texturing Surfaces, Lighting, Special effects

### **References:**

1. David Hillman, "Multimedia Technology & Applications", Galgotia Publications
2. Rajneesh Agrawal, "Multimedia Systems", Excel Books.
3. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications.
4. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.

## **3MIT2.1 SECURITY ANALYSIS OF SOFTWARE**

### **Overview of Computer Security**

Threats, risks, vulnerabilities, safeguards, attacks, exploits, Information states, Security at the various states of information- processing, storage and transmission; Definition of security based on current state and reachable states, Comprehensive model of security, Confidentiality, integrity and availability, Risk management, corrective action, risk assessment and physical security.

### **Access Control**

Access control matrix, Access control lists, Capabilities, Role-based access, control and Application dependence.

### **Security Policies**

Types of policies, Role of trust, Information states and procedures, Types of access control, Separation of duties, Application dependence, Importance for automated information systems (AIS) and Security planning

Confidentiality Policies - Goals and definitions, Bell-LaPadula model and Multi-level security.

Integrity Policies - Goals and definitions, Information states and procedures, Operating system integrity, Biba model and Clark-Wilson model

Hybrid Policies - Chinese Wall model and Role-Based Access Control

### **Authentication**

Passwords, Challenge-response, Biometrics, Location, Combinations and Application to access control/authorization

### **Malicious Logic**

Trojan horses, Computer viruses, Computer worms, Logic bombs, Defenses and countermeasures

### **Auditing**

Auditing mechanisms, Auditing system design, Privacy issues, Trails and logs, Access control issues, Application dependence

### **Intrusion Detection**

Principles, Models, Architecture, Organization and Intrusion response

### **Network Security**

Policy development, Network organization, Firewalls, Availability, Access control issues, Attacks anticipation, Traffic analysis, Public vs private

**Administrative policies**

Purposes, Back-up policies, E-mail security and privacy policies, Wireless policies, FAX security policies, Internet security policies, Incident response policies, Testing and validation policies, Application development control, Facilities management, Copyright management, Licensing management, Biometrics access management, Software piracy, Law enforcement issues, assisting investigations, Media destruction/sanitization/protection, Security planning, Resources misuse or abuse, Documentation and auditing.

**References:**

1. Matt Bishop, "Introduction to Computer Security", by Addison Wesley, 2005.
2. Viega, John, Gary McGraw, "Building Secure Software: How to Avoid Security Problems the Right Way", Addison-Wesley, Boston, 2002.
3. Oaks, Scott, "Java Security", Second edition, O'Reilly & Associates, Inc., Sebastopol, CA, 2001.

**Additional material:**

1. Carnegie-Mellon documents on Information Assurance.
2. Guide for the Security Certification and Accreditation of Federal Information Systems.
3. RFC 2196 Site Security Handbook.



## **3MIT2.2 SERVICE ORIENTED ARCHITECTURE**

### **SOA Fundamentals**

Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

### **Web services Technologies**

XML technologies – XML, [DTD](#), [XSD](#), [XSLT](#), [XQuery](#), XPath

Web services technologies - Web services and SOA, WSDL, SOAP, UDDI

WS Standards (WS-\*) - Web services and Service-oriented enterprise (SOE), WS-Coordination and WS-Transaction, Business Process Execution Language for Web Services (BPEL4WS), WS-Security and the Web services security specifications, WS-Reliable Messaging, WS-Policy, WS-Attachments

### **SOA Planning and Analysis**

Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA)

### **SOA Design and implementation**

service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance

### **Managing SOA Environment**

Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle

### **References**

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Prentice Hall Publication, 2005.
2. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, "Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap", IBM Press Publication, 2005.
3. Sandy Carter, "The New Language of Business: SOA & Web 2.0", IBM Press, 2007.
4. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall Publication, 2004  
SOA and Web services resources on IBM's website.

### **3MIT2.3 INFORMATION STORAGE & MANAGEMENT**

#### **Complexity of Information Management**

Proliferation of Data, Data Center Evolution, Managing Complexity, I/O and the five pillars of technology, Storage Infrastructure, Evolution of Storage

#### **Storage Systems Architecture**

Modern Storage Systems, Storage Systems, Intelligent Disk Sub-systems , Physical Disks , Back End ,Cache ,Front End , Host Environment

#### **Introduction to Networked Storage**

Storage Networking Overview, Direct Attached Storage, Storage Area Networks, Case study – Applying SAN concepts, Network Attached Storage

Case study - Applying NAS concepts, IP SAN, CAS, Hybrid Network Storage Based Solutions/ Emerging Technologies

Case study - Applying SAN, NAS, IPSAN concepts

#### **Introduction to Information Availability**

Business Continuity Overview, Data Availability,

Business Continuity – Local, Case study – Applying local information availability strategies, Business Continuity – Remote, Case study – Applying remote information availability strategies

#### **Disaster Recovery Managing and Monitoring**

Monitoring in the Data Center, Case study – Monitoring exercise, Management in the Data Center, Case study – Managing exercise

#### **References:**

1. Marc Farley Osborne, "Building Storage Networks", Tata McGraw Hill, 2001.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, 2003.
3. NIIT, "Introduction to Information Security Risk Management" Prentice-Hall of India, 2000.