Christ University
Hosur Road, Bangalore- 29

PG DEPARTMENT OF
COMPUTER SCIENCE

SYLLABUS FOR
MS COMPUTER SCIENCE

Proposed Course :

M.S. (Computer Science - Professional)

1. Introduction

MS programme is offered by the University for the professionals working in the software industry or related fields. This program is intended to enhance their existing academic foundations with comprehensive understanding of the use and application of information technology. The programme focuses on Advanced Operating Systems, Data Structures, Software Project Management, Networks, Data Warehousing and Data Mining.

2. Course Objective

- The program is designed to help software professionals who are already employed to further their knowledge in their respective domains.
- To enhance the project management skills.
- To facilitate software professionals to take lead roles.
- To understand and assimilate knowledge and skills to apply in their industry.
- To introduce contemporary theoretical concepts about the processes, standards and practices in software development life cycle.
- To assist in career advancement by acquiring additional degree.

3. Duration

Two years (Four semesters).

4. Eligibility for Admission

- Students who have completed the undergraduate course in computer science or computer applications from any university with a minimum of 1 year working experience in Software Industry/IT/ITES.
  OR
  Bachelor degree in Science / Engineering with 3 years of experience in Software Industry/IT departments.
  OR BE/B Tech (CS/IT/IS/Electronics/Telecommunications)
- The applicant must have a cumulative undergraduate record of 55% in aggregate or equivalent grade.
- Admission to the program is based on the performance of the candidate in the qualifying examination and interview.

5. The Course Structure

Semester	Subjects/Papers	Subject Code	Max. Marks	Credit
I	1. Advanced Operating Systems	MSP131	100	04
	2. Advanced Database System Concept	MSP132	100	04
	3. Data Structures and Algorithms	MSP133	100	04
	4. Computer Architecture	MSP 134	100	04
	5. Project Lab-1	MSP 151	100	02
II	1. Software Project Management	MSP 231	100	04
	2. Computer Networks	MSP 232	100	04
	3. Data Warehousing and Data Mining	MSP 233	100	04
	4. OOAD using UML	MSP 234	100	04
	5. Project Lab-2	MSP 251	100	02
III.	1. Computer Graphics	MSP331	100	04
	2. System Software	MSP332	100	04
	3. Elective-1	MSP343*	100	04
	4. Elective-2	MSP344*	100	04
	5. Mini Project	MSP351	100	02
IV	1. Elective-3	MSP441*	100	04
	2. Elective-4	MSP442*	100	04
	3. Industry Project	MSP451	300	06
Total			**2000**	**68**

Electives for III Semester (Choose any two)	Electives for IV Semester (Choose any two)
1. MSP343A Data Communication	1. MSP441A Wireless Communication
2. MSP343B Software Quality Assurance and Testing	2. MSP441B Mobile Computing
3. MSP343C Software Systems	3. MSP441C Software Architecture
4. MSP343D Digital Image Processing	4. MSP441D Neural Networks
1. MSP344A Networks security	1. MSP442A Data Storage Technologies
2. MSP344B Total quality management	2. MSP442B Concurrent and Distributed Systems
3. MSP344C Critical Systems Engineering	3. MSP442C Web Engineering

6. Method of Evaluation

1. Evaluation Pattern: 60% CIA + 40% ESE
2. Tutorials / Assignments / Tests / Quiz / Seminar.
3. Attendance is part of the CIA component.
4. Minimum percentage to pass in each paper is 50% (CIA + ESE).

7. Proposed Intake

- 80 students maximum
- 40 students per batch

QUESTION PAPER PATTERN FOR ALL COMPUTER SCIENCE PAPERS

- Question paper has to be set for the total marks of 100
- Examination duration is 3 hours
- The syllabus is divided in to five major units.
- From first unit 2 questions and from other units 3 full questions has to be set.
- Each full question carries 10 marks
- Answer any 10 questions out of 14.

MSP131 Advanced Operating System

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

General Overview of the System - System Structure – Operating System Services – introduction to kernel-architecture of unix operating system-introduction to system concepts-kernel data structures.

The Buffer cache - Buffer Headers – Structure of the buffer pool – Retrieval of a buffer – scenarios for retrieval of a Buffer-Reading and writing disk blocks - Advantages and disadvantages of the buffer cache.

Internal Representation of files - Inodes, structure of a regular file, directories, conversion of a path to an inode, Super Block, inode assignment to a New file-Allocation of Disk Blocks-other file Types.

Unit II. **(12)**

UNIX Process Management - The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process – Sleep – Implementation of System Calls.

Process Control - Process Creation – Signals – Process Termination – Invoking other programs – PID & PPID – Changing the size of a process – The shell – System Boot and the init process - Implementation of System Calls.

Process Scheduling and Time - Process Scheduling – System calls for Time – Clock Interrupt Handler - Implementation of System Calls.

Unit III. **(12)**

Memory Management: Swapping – Segmentation – Demand Paging – A Hybrid System with Swapping and Demand Paging.

The I/O Subsystem: Driver Interfaces – Disk Drivers – Terminal Drivers – Streams.

Inter Process Communication (IPC): Process Tracing – System V IPC – Network Communications – Sockets.

Multiprocessor Systems: Problem with Multiprocessor Systems – Master and Slave processors – Semaphores

Unit IV. **(12)**

Introduction to Distributed system- hardware concepts-Bus-Based multiprocessors-switched multiprocessors-Bus based multi computers-switched multicomputers-software concepts-network Operating systems-True Distributed systems-Multiprocessor Timesharing systems-design issues-Transparency-flexibility-reliability-performance-scalability.

Distributed File system Design-the file service interface-the directory server interface-semantics of file sharing.

Unit V. **(12)**

Distributed file system implementation-file usage-system structure0-caching-replication-an example sun's network file system

Case study MACH: Introduction to MACH - Process management in MACH-processes-threads-scheduling-memory management in MACH-Virtual memory-memory sharing

Text Books:

1. Maurice J Bach, *The Design of Unix Operating System*, Prentice Hall of India Pvt. Ltd., New Delhi, Reprint 2007.
2. Andrew S Tanenbaum, *Distributed Operating Systems*, PHI, reprint 2006.

Reference Books:

1. Stan-Kelly-Bootle, *Understanding Unix*, BPB Publications, New Delhi,reprint,2006
2. Arnold Robbins, *UNIX in a Nutshell*, In a Nutshell series, 3rd Edition, reprint 2007.
3. George Coulouris, Jean Dollimore, Tim Indberg, Distributed Systems Concepts and Design, 3rd Edition, Pearson Education, 2002
4. Pradeep K Sinha, *Distributed Operating Systems – Concepts and Design*, PHI, 2006.

MSP132 Advanced Database system concepts

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction: Database-System Applications, Purpose, View of data, languages, Relations databases, design, Object-based and semistructured, storage and querying, transaction management, analysis, architecture, users and administrators.
Relational Databases: Relational Model, SQL, Advanced SQL

Unit II. **(12)**

Database Design and the ER Model: Overview, ER Model, Constraints, ER Diagrams and design issues. Weak entity sets, Extended features, Relational Schemas, UML. Design for Banking Enterprise.

Unit III. **(12)**

Object-Based Databases: Overview, complex datatypes, Structured Types and Inheritance in SQL, Table inheritance, Array and Multiset, Reference Types, O-R Features, Persistent Programming languages, Object-Oriented versus Object-Relational.
XML: Motivation, structure, Schema, Querying and Transformation, Interfaces to XML, Storage and XML Applications.

Unit IV. **(12)**

Data Querying: Query Processing overview, measures, Selection, Join and other operations, sorting, Evaluation of Expression. Query Optimization overview, Transformation of Relational Expressions, Statistics of Expression Results, Evaluation plans.
Transaction Management: Transactions, Concurrecy control and Recovery System.

Unit V. **(12)**

System Architecture: Parallel Databases: I/O parallelism, Interquery, Intraoperation and Design of parallel systems. Distributed Databases: Types, Data storage, Transactions, Protocols, Concurrency control, Availability, Query Processing, Heterogeneous and Directory systems.
Case Studies: PostgreSQL / Oracle / Microsoft SQL server

Text Books:

1. Abraham Silberschatz, Henry *Database System concepts* McGRAW-Hill International, 5th Edition, 2006

Reference Books:

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Addison-Wesley, 2nd Edition, 2004
2. McFadden R. Fred, Hoffer A Jeffrey and Prescott B Mary, *Modern Database Management System,* Addison-Wesley, 5th Edition, 1999
3. O'neil Patric, O'neil Elizabeth , *Database Principles, Programming and Performance*, Argon Kaufmann Publishers, 2nd Edition, 2002

MSP133 Data Structures and Algorithms

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction

Algorithm, An abstract data type, Model for ADT, Complexity of algorithms-:Time & Space, Operations on linear lists, Algorithmic efficiency.

Linked Lists

Linked list algorithms- Processing a linked list, Linked list algorithms (Create, Traverse, Insert, Delete, Search, Destroy), Doubly linked lists structures and it's operations, Applications of linked lists. Algorithmic efficiency in terms of space and time.

Stacks and Queues

Basic Operations, Implementation, Stack applications, Recursion- A Case Study, Queue operations, implementation, Applications of a queue.

Unit II. **(12)**

Trees

Basic tree concepts, Binary trees, Binary tree traversals, Expression trees, General trees-Changing general tree to binary tree, General tree insertion, Search trees, Binary search trees, Operations, Traversals-BFS and DFS methods, Searching a BST, Algorithms for and traversing and searching. AVL trees, AVL Balance factor, Balancing trees, AVL Insert, AVL Delete,

Unit III. **(12)**

Multiway trees

M-Way search trees**,** B Trees, B-Insertion, B-Tree Deletion, B –Tree Traversal-Tree Search, Simplified B-Trees - 2-3 Tree, 2-3-4 Tree, B-Tree Variations–B * Trees, B+ Trees.

Unit IV. **(12)**

Graphs

Terminology, operations, Graph storage structures – Adjacency Matrix, Adjacency lists, Graph algorithms- Create insert vertex, Delete vertex, Retrieve vertex, Depth first traversal and Breadth First Traversal, Networks- Minimum spanning tree, Shortest Path algorithm.

Unit V. **(12)**

Advanced Sorting & Searching concepts

General sort concepts, O Notation, Sort Algorithms-Quick Sort, Heap sort, Sorting using a Heap, Shell sort, Merge sort, radix sort, merging two sorted lists. Efficiency considerations, Comparative study.

Searching concepts

Sequential searching, Binary search, Hashed list searches, Hashing methods-Direct method, Subtraction method, Modulo-division method, digit extraction mid square method, folding method, Rotation method, pseudorandom method, Hashing algorithm, Collision resolution.

Text Books:

1. Richard F. Gilberg, Behrouz A. Forouzan,"*Data Structure. A Pseudocode Approach with C* ", 3rd Edition, Thomson Publications, reprint 2006.
2. A M Tanenbaum, Y Langsam and M. J. Augenstein, "*Data Structure using C*", 2nd Edition, Prentice- Hall, India, 2007.

Reference Books:

1. Robert Kruse, Tondo C L, Bruce Leung, "*Data Structures & program Design In C*", Pearson Education, 2nd Edition, 2004.
2. U.A.Deshpande and O. G. Kakde , "Data Structures and Algorithms, ",ISTE- learning Materials Centre, New Delhi

MSP134 Computer Architecture

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. (13)

Design Methodology

System design- system representation, design process-Gate level, Register level-register level components, Programmable logic devices, register level design, Processor level-Processor level components-processor level design

Processor basic

CPU organization-fundamentals, additional features, Data representation-Basic formats, fixed point numbers, floating point numbers, Instruction sets-Instruction formats, Instruction types, programming considerations

Unit II. (11)

Data path design

Fixed point arithmetic-addition, subtraction, Arithmetic Logic units-combinational ALUs, sequential ALUs, Advanced topics- Floating point arithmetic, pipeline processing

Unit III. (12)

Control design

Basic concepts- basic concepts, Hardwired control, design examples, Microprogrammed control-basic concepts, multiplier control unit, CPU control unit, Pipeline control- Instruction pipeline, pipeline performance, superscalar processing

Unit IV. (11)

Memory Organization

Memory technology-memory device characteristics, random access memories, serial access memories, Memory systems-multi level memories, address translation, memory allocation, caches-main features, address mapping, structure versus performance

Unit V. (13)

System Organization

Communication methods- Basic concepts, bus control, IO and system control-Programmed IO, DMA, Interrupts, IO Processors, Operating systems, Parallel processing-processor level parallelism, multiprocessors, fault tolerance

Text Book:

1. John P.Hayes, *Computer Architecture & Organization*, McGraw Hill International Editions, 3rd Edition, 2003
2. Stalling Williams. *Computer Organization and Architecture-Designing for Performance*, Prentice Hall, 4th Edition, 2004

Reference Books:

1. Mano M Morris, *Computer System Architecture*, PHI, 3rd Edition, 2006
2. Nicholas Carter, *Computer Architecture*, Tata-McGraw Hill,2006

3. Behrooz Parhami, *Computer Architecture- From Microprocessors to Supercomputers,* Oxford University Press, 2006

MSP231 Software Project Management

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction to Software Project Management

Software Projects, other projects, The Programme, The Management Spectrum, Project management, Project manager, Stakeholders, business case, requirement specification, Setting objectives,

Unit II. **(12)**

Project planning & evaluation

Step-wise method of project planning, Strategic, technical, cost-benefit & risk assessment.

Selection of appropriate Project approach

Choosing Technologies, Process models, technical plan.

Unit III. **(12)**

Activity planning

Objectives, network planning models, Network Analysis

Software Effort Estimation & Risk Management

Introduction, Problems, basis for estimating, metrics, Estimation techniques. Nature, types of risk, planning, monitoring, managing & controlling risk, evaluating schedule risks.

Unit IV. **(12)**

Resource allocation

Nature of resources, identifying, scheduling, counting cost, publishing resource schedule.

Monitoring & control, Managing people and organizing teams.

Creating framework, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control. Organizational behavior: selection, instruction, motivation of staff, working in groups, team, leadership, organizational structures, stress, health and safety.

Unit V. **(12)**

Software Quality, Quality assurance, Configuration Management

Quality concepts, software quality, product versus process quality, management, external standards, techniques to enhance software quality, quality plans, SQA activities. Baselines and items, The SCM process.

Managing Contracts

Introduction, The ISO 12207 approach, contract management.

Project Management Process groups: a case study – JWD consulting's intranet project.

MS- Project.

Overview, Project, Scope, Time, Cost, Human Resource, Communications management, **Exercises :** A-1: Web Siite development & A-2 : A software training program.(From Text Book 2).

Text Books:

1. Hughes, Bob and Cotterell, Mike, *Software project Management*, 4th Edition, TMH, 2006.
2. Kathy Schwalbe, *Information Technology Project Management 4th edition,,* Thomson Course Technology, 4th Edition, India edition. Reprint 2007

Reference Books:

1. Kieron Conway, *Software Project Management – From Concept to Deployment,* Dreamtech Press, 1st Reprint Edition, 2002.
2. Kelkar S. A, *Information Technology Project Management, A concise study*, PHI, 2005
3. Royce, Walker, *Software project Management A unified Framework*, Pearson Education, 2006.
4. Pressman S Roger, *Software Engineering*, Mc Graw Hill International Editions, 4th edition, 1997
5. Sommerville, Ian, *Software Engineering*, Addison Wesley, 5th Edition, 2000

MSP232 Computer Networks

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(13)**

Introduction

Comparison of ISO OSI and TCP/IP reference models,

Example Networks –Connection Oriented Networks-: X.400, X.25, Frame Relay and ATM; Wireless Network-Wireless LAN: Bluetooth, Wireless WAN: SONET- Architecture – SONET Layers

The Physical Layer

Transmission media, Wireless transmission

Unit II. **(13)**

The Data Link Layer

Data Link layer design issues, Error Detection and Correction, Elementary Data Link protocols-unrestricted protocol, simplex stop & wait protocol, simplex protocol for a noisy channel, Sliding Window protocols-one bit sliding window protocol, protocol using Go back N, Example Data link protocol- Higher Level Data Link Control, Data link layer in the internet, Point-to-point protocol

The Medium Access Sublayer

The Channel Allocation problem, Carrier sense Multiple access protocols: CSMA with collision detection, collision free protocols: A bit map protocol, Binary countdown, Limited contention protocol, Adaptive Tree walk protocol, GSM, CDMA, IEEE standard 802.x for LANs and MANs: Ethernet cabling, Differential Manchester Coding, High-Speed LAN's, Satellite Networks.

Unit III. **(12)**

The Network Layer

Network layer design issues, Routing algorithms-Optimality principle, shortest path routing, Flooding, flow based routing, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing, Congestion control algorithms: congestion prevention policies, Traffic shaping, Congestion control in virtual circuit subnets, choke packets, Load shedding, Jitter control, congestion control for multicasting, Internetworking, The Network layer in the Internet.

Unit IV. **(11)**

The Transport Layer

The Transport service, Elements of Transport protocols: addressing, Establishing a connection, Releasing a connection, Flow control and buffering, Multiplexing, Crash recovery, A simple Transport protocol, The Internet Transport protocols (TCP and UDP), Performance Issues.

Unit V. **(11)**

The Application Layer

DNS-Domain Name System, Electronic Mail, World Wide Web.

Multimedia: Digitizing Audio and Video, Audio and Video Compression, Streaming Stored Audio/video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP

Text Book:

1. Tanenbaum, Andrew S, *Computer Networks*, Pearson Education, 4th Edition, 2003.
2. Forouzan, Behrouz, *Data Communications and Networking*, 4th Edition, 2006.

Reference Books:

1. Stallings, William, *Data & Computer Communications*, Pearson Education Asia, 6th Edition, 2001.

MSP233 Data Warehousing and Data Mining

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction

Data Mining – Process and architecture - Kinds of Data to be mined - Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major Issues in Data Mining.

Data Preprocessing

Preprocessing - Descriptive Data Summarization – Measuring the central tendency- Measuring the dispersion of data - Data Cleaning - Missing Values - Noisy Data - Data Cleaning as a Process - Data Integration and Transformation - Data Reduction-Data Cube Aggregation-Attribute Subset Selection-Dimensionality Reduction-Numerosity Reduction.

Unit II. **(12)**

Data Warehouse and OLAP Technology

Introduction to Data Warehouse A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization

Efficient Methods for Data Cube Computation – Road map - Multiway array aggregation – Star cubing, Further Development of Data Cube and OLAP Technology.

Unit III. **(12)**

Data Warehouse Design and Architecture

The case for dimensional modeling – Putting Dimensional modeling together: the data warehouse bus architecture – Basic dimensional modeling techniques. The value of architecture – An architectural framework and approach – Technical architecture overview – Back room data stores – Back room services.

Data Staging

Data staging overview – Plan effectively – Dimension Table staging – Fact Table loads and warehouse operations – Data quality and cleansing – issues.

Unit IV.

(12)

Association Rule Mining

Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods – Apriori algorithm, Generating Rules – Improving efficiency – Mining frequent itemset without candidate generation.

Classification and Prediction

Issues Regarding Classification and Prediction, Classification by Decision Tree – Decision tree induction – Attribute selection, Bayesian Classification – Bayesian Theorem - naïve Bayesian, Prediction, Accuracy and Error Measures.

Cluster Analysis

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods – K-Means and K-Medoids, Hierarchical Methods – Agglomerative and Divisive, Density Based Methods - DBSCAN, Outlier Analysis – Statistical based.

Unit V.

(12)

Mining Time-Series and Spatial Data

Mining Time-Series Data – Trend analysis – Similarity search, Spatial Data Mining-Spatial Data Cube Construction and Spatial OLAP-Mining Spatial Association and Co-location Patterns-Spatial Clustering, Classification Methods-Mining Raster Databases

Applications and Trends in Data Mining

Data Mining Applications, Data Mining System Products and Research Prototypes, Social Impacts of Data Mining.

Text Books:

1. Jiawei Han and Micheline Kamber, *Data Mining: Concepts and Techniques*, Morgan Kaufmann Publishers, San Francisco, USA, 2nd edition, 2006.
2. Kimball, Ralph & et al, *The Data Warehouse Lifecycle Toolkit*, John Wiley & Sons, 2006

Reference Books:

1. Claudia Imhoff, Nicholas & et al, *Mastering Data warehouse Design*, J Wiley, 2003.
2. Inmon W H, *Building the Data Warehouse***,** John Wiley & Sons, 3rd edition, 2005.
3. Margaret H. Dunham, *Data mining-Introductory and Advanced topics* Pearson Education, 2003.
4. Witten and E. Frank, *Data Mining : Practical Machine Learning Tools and Techniques*, Morgan Kaufmann Publishers, 2005.

MSP234 OOAD Using UML

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Complexity: The inherent complexity of software, The Structure of complex systems, Bringing order to chaos, On designing complex systems, Categories of analysis and design methods.
The Object Model: The evolution of object model, Elements of object model, Applying the object model, Foundations of the object model.

Unit II. **(13)**

Classes and Objects: The nature of an object, Relationship among objects, The nature of a class, Relationship among classes, The interplay of classes and objects, On building quality classes and objects, Invoking a method.
Classification:
The importance of proper classification, Identifying classes and objects, Key abstraction and mechanisms, A problem of classification.

Unit III. **(12)**

Basic Behavioral Modeling: Interactions, Use Cases, Use Case Diagrams, Interaction Diagrams, and Activity Diagrams.

Unit IV. **(12)**

Advanced Behavioral Modeling: Events and Signals, State Machines, Processes and Threads, Time and Space, State chart Diagrams.

Unit V. **(11)**

Architectural Modeling: Components, Deployment, Collaborations, Pattern and Frameworks, Component Diagram, Deployment Diagrams, Systems and Models.

Text Book

1. Grady Booch, Object Oriented analysis and Design with Applications, Pearson Education, Ninth Indian Reprint 2007.
2. Grady Booch, James Rumbaugh and Ivar Jacobson, The Unified Modeling Languages User Guide, Addison Wesley Fourth Indian Reprint 2000.

Reference Books:

1. Mike O'Docherty,"Object –Oriented Analysis and Design- Understanding system development with UML2.0", John Wiley and sons, 1st edition, 2005
2. James Rumbaugh, et al," Object –Oriented Modeling and Design", PHI,reprint 2006.

MSP331 Computer Graphics

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Conceptual overview of computer graphics Algorithmic generation of basic Primitives (lines, circles, ellipses), two dimensional transformation concepts-Translation, rotation, scaling with matrix representation, homogeneous Co-ordinates, concept of window, window to view port transformation, Line Clipping algorithms-Cohen-Sutherland, Mid-point division and Liang-Barsky Algorithms, Polygon Clipping-Sutherland-Hodgeman Algorithm.

Unit II. **(12)**

3D viewing and modeling

Viewing pipeline, viewing co-ordinates, View plane transformations, parallel projection, perspective projection, View volumes, matrix representation for 3D transformations, Projection Transformation, View port transformation, Clipping planes.

Unit III. **(12)**

Color and Lighting

Properties of light, achromatic light, chromatic colors, color models-YIQ, CMY, HSV,HLV,Conversion between HSV and RBG,

Light sources, Basic Illumination models : Aambient light, Diffuse Reflection, Specular reflection Phong Model,Warn Model,Polygon Rendering Method: Constant Integrity Shading,Gourand Shading,Phong Shading,Fast Phong Shading..

Unit IV. **(12)**

Curves and surfaces

Spline representations, interpolation and approximation splines, continuity conditions, Cubic spline interpolation, Bezier curves and surfaces, B-spline curves and surfaces, Beta splines.Rational Spilines,Octtrees.

Unit V. **(12)**

OpenGL (limited to built-in functions not complete programs)

Introduction to OpenGL

What is OpenGL, Sample Code, OpenGL Command Syntax, OpenGL as a State Machine, OpenGL Rendering Pipeline.

OpenGL Built-in Functions

Implementation of Translation, Rotation, Scaling and Composite Transformation in OpenGL, Troubleshooting transformations in Open GL, Specifying color and Shading Model in OpenGL, Real World and Open GL lighting, Creating light sources in Open GL, Selecting a lighting model in Open GL, Texture Mapping – One-Dimensional Textures, Two dimensional . GL-Evaluators, one dimensional and two dimensional evaluator in OpenGL.

Text books:

1. Donald Hearn, M. Pauline Baker, *Computer Graphics*.PHI, 2nd Edition, New Delhi, Reprint 2006.
2. *OpenGL Redbook Version 1.1* (Online)

3. Zhigang Xiang, Roy A Plastock, Adapted by: P S Avadhani, Computer Graphics, Tata McGraw Hill, 2nd Edition, New Delhi, Special Indian Edition 2006.

Reference Books:

1. Foley, Vandam & Feiner, Hughes, *Computer Graphics Principles & Practice, Second edition in C,* Pearson Education (Singapore Pvt Ltd, Indian Branch, Delhi) 6th Indian Reprint 2006.
2. Richard S Wright, Jr. Michael Sweet,*Open GL Super Bible*, 2nd Edition,2003.
3. Woo, Mason and Neider, Jackie, *Open GL Programming guide,4th edition,2006.*

MSP332 System Software

Total teaching Hours/Semester: 60 *No of Lecture Hours/Week: 04*

Unit I. **(10)**

Introduction

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture – Data and instruction formats - addressing modes - instruction sets - I/O , SIC /XE Machine Architecture – Data and instruction formats - addressing modes - instruction sets –I/O , SIC Programming examples.

Unit II. **(13)**

Assemblers

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions – Assembler Design options - One pass assemblers and Multi pass assemblers- Implementation Example – MASM Assembler.

Unit III. **(12)**

Loaders And Linkers

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

Unit IV. **(13)**

Macro Processors

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters, Macro processor design options –Recursive macro Expansion – General purpose Macro Processor – Macro processing within Language translators , Implementation example – MASM macro processor.

Unit V. **(12)**

Compilers

Basic compiler functions – Grammars, Lexical analysis, Syntactic Analysis, Code generation, Machine dependent Compiler features – Intermediate form of the program – Machine Dependent Code Optimization , Machine independent Compiler features – Structured Variables – Machine Independent Code Optimization - Storage Allocation- Block Structured Languages, Compiler Design options – Division of passes – Interpreters – P-Code Compilers – Compilers – Compilers, Implementation Examples – SUNOS C Compiler

Text Book

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2005.

References

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2006
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2003

MSP343A Data Communication

Total Teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction

Applications – Vehicles, Emergencies, Business, Replacement of wired networks, Infotainment and more, Location dependent services, Mobile and wireless devices, A short history of wireless communication, A market for mobile communications, Some open research topics, a simplified reference model ATM – Asynchronous Transfer Mode - Protocol Architecture – ATM Logical Connections – ATM Cells – Transmission of ATM Cells – ATM Service Categories – ATM Adaptation Layer

Unit II. **(12)**

Wireless transmission

Frequencies for radio transmission – Regulations, Signals, Antennas, signal propogation – Path loss of radio signals, additional signal propagation effects, Multi-path propagation, Multiplexing – Space division multiplexing, Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Modulation – Amplitude shift keying, frequency shift keying, Phase shift keying, Advanced frequency shift keying, Advanced Phase shift keying, Multi carrier modulation, Spread spectrum – Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems

Unit III. **(12)**

Medium access Control

Motivation for a specialized MAC – Hidden and exposed terminates, Near and far terminates, SDMA, FDMA, TDMA – Fixed TDMA, Classical Aloha, slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access, CDMA – Spread Aloha multiple access, Comparison of S/T/F/CDMA

Unit IV. **(12)**

Telecommunications systems

GSM – Mobile services, System architecture, Radio interface, protocols, Localization and calling Handover, Security, New data services, DECT – System architecture, Protocol architecture, TETRA, UMTS and IMT–2000 – UMTS releases and standardization, UMTS system architecture, UMTS radio interface, UTRAN, Core network, Handover

Unit V. **(12)**

Satellite systems

History, Applications, Basics – GEO, LEO, MEO, Routing, Localization, Handover, Examples

Broadcast systems

Overview, Cyclical repetition of data, Digital audio broadcasting – Multi-media object transfer protocol, Digital video broadcasting – DVB data broadcasting, DVB for high-speed internet access, Convergence of broadcasting and mobile communications

Text Book:

1. Stallings William, *Data and Computer Communications*, PHI, 8th Edition, 2007.
2. Schiller Jochen, "Mobile Communications", Pearson Education Limited, 2nd edition, 2003

Reference Books.

1. YI Bing Un,"*Wireless and Mobile Network Architectures*", John Wiley publications, 2006.
2. Mullett," *Introduction to Wireless Telecommunications systems and Networks*", DELMAR CENCAGE leaning Publications First Indian reprint 2008.

MSP343B Software Quality Assurance and Testing

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week:60***

Unit I. **(12)**

Introduction to software quality

Quality: popular view, Quality: professional view, software quality, total quality management, The defect prevention process, process maturity framework, quality standards.

Software quality Assurance

Quality management, The role of SQA, launching the SQA program, the SQA plan SQA consideration, SQA people

Unit II. **(12)**

Fundamentals in Measurement Theory

Levels of measurement some basic measures, reliability and validity

Software quality metrics

Product quality metrics, in-process quality process, example of metrics program –motorola, HP

Unit III. **(12)**

Seven Basic Quality Tools

Ishikawas' seven basic tools, checklist, pareto diagram, histogram, runchart, scatter diagram control chart cause and effect diagram.

Defect Removal Effectiveness

Literature review, a close look at DRE, defect removal effectiveness and quality planning

Unit IV. **(12)**

Fundamentals of Software Testing

Software Testing Principles, Types of Software Tests, Test Planning, test Development, Test Execution and reporting, Test tools and methods ,Real time testing, The test organization

Inspection and Walkthroughs

Inspection and walkthrough, code inspection, an error checklist for inspection, Walkthrough – desk checking, peer rating.

Unit V. **(12)**

Debugging and extreme Testing

Extreme programming basics, extreme testing, extreme testing applied

Case Study: Testing Internet application

Text Book:

1. Stepen H Kan, *Metrics and Models in Software Quality Engineering*, 2nd edition ,reprint 2006

Reference Books:

1. Glenford J.Myers , *The art of Software testing"* John Wiley and Sons publications, 2004
2. watts S.Humphrey, M*anaging the software process,* Addison – Wesley Publications, 2006
3. Nina S. Godbole, *Professional Software Quality Assurance*: *Principles and Practice,* Alpha Science International Publications, 2004
4. Daniel Galin, Sof*tware Quality Assurance: From Theory to Implementation* Pearson/Addison Wesley Publications, 2004

MSP343C Software Systems

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week:60***

Unit I. **(12)**

Communication problem in Software Engineering - What are formal methods? Need for formal specification-Advantages-disadvantages-Approaches to formal specifications-Mathematical concepts-Sets - Prepositional and Predicate Logic.

General Software Testing: Overview of the maintenance and testing activities within the software life cycle. Syntax Testing. Formal Methods. Black Box Testing Using Formal Methods. Software Related Risks.

Unit II. **(12)**

. Software Maintenance: Major maintenance activities. Estimating maintenance costs and productivity. Predicting maintainability with software quality metrics. Economics and expectations of software reengineering. Principles of software reuse and reverse engineering techniques.

Unit III. **(12)**

. Management and Quality Assurance: Cost estimation. Project scheduling. Specification of work units. Quality/complexity metrics. Software availability. Measurement and prediction of software reliability. Software verification, correctness proofs, symbolic execution, walkthroughs, inspections.

Unit IV. **(12)**

. Testing in Small: Testing strategies, including unit level, path and dataflow testing, domain testing, decision tables, and state-based testing. Coverage metrics. Impact of object-oriented testing. Effort, efficiency, and effectiveness concerns. JUnit and JCoverage Testing Tools.

Unit V. **(12)**

. Testing in Large: Integration (decomposition based, bottom-up, top-down, call graph based, and atomic system functions). Validation and system testing (data, action, port, event and thread testing, structural and functional approaches, operational profiles). Performance and robustness testing.

Text Book

1. M. Lippert. S. Roock, and H. Wolf. *Extreme Programming in Action*. John Wiley &Sons, LTD, 2002.

References

1. Roger S. Pressman, *Software Engineering practitioner's Approach*, 6th Edition, 2004.

2. Kent Beck ,*Extreme Programming Explained: Embrace Change.* Addison-Wesley, reprint 2004.

MSP343D Digital Image Processing

Total Teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Digital Image Fundamentals

Digital image Representation – Fundamental steps in Image Processing - Elements of digital image processing systems – Elements of visual perception – A simple image model – Sampling and Quantization – Some basic relationships between pixels – Imaging geometry.

Unit II. **(12)**

Image Transforms

Introduction to the Fourier transform – The Discrete Fourier transform – Some properties of the two dimensional Fourier transform – The Fast Fourier transform – Walsh, Hadamard, Discrete Cosine, Haar, and Slant transforms – The Hotelling transform.

Unit III. **(12)**

Image Enhancement And Restoration

Spatial domain and frequency domain methods – Enhancement by point processing – Spatial filtering – Enhancement in the frequency domain – Color Image processing. Degradation model, Diagonalization of circulant and Block circulant matrices, Inverse filtering, Least Mean square Filter, constrained Least square Restoration Interactive Restoration.

Unit IV. **(12)**

Image Compression

Fundamentals of image compression – Image compression models – Elements of Information theory – Error free compression – Lossy compression.

Unit V. **(12)**

Image Segmentation

Detection of discontinuities – Edge linking and boundary detection – Thresholding – Basic Formulation of Region oriented segmentation - The use of motion in segmentation.

Text Book:

1. Gonzalez, Rafael C. and Woods, Richard E. *Digital Image Processing*, Addison Wesley, 2nd Edition, reprint 2006.

Reference Books:

1. Jain, Anil K. *Fundamentals of digital image processing*, PHI, 2002.
2. Chanda and Majumder,D. Dutta. *Digital image processing and Analysis*, PHI, 2002.

MSP344A Network Security

Total Teaching Hours/Semester: 60 *No of Lecture Hours/Week: 04*

Unit I. **(13)**

Introduction to the concepts of security, the need for security, security approaches, principles of security, types of attacks.

Convention Encryption: Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of operation, Conventional Encryption algorithms.

Unit II. **(12)**

Public Key Encryption And Hash Functions: Public Key Cryptography, Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Cryptography Message Authentication and Hash Functions Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions.

Unit III. **(12)**

Hash and Mac Algorithms: Introduction, Nifty things to do with a Hash, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-I), RIPEMD, HMAC, CMAC, Digital Signatures, Authentication Protocols -Digital Signature Standard.

Unit IV. **(11)**

Network Security Applications: Authentication Applications, Kerberos, X.509 authentication service, public key Infrastructure (PKI), Electronic Mail Security, Pretty Good Privacy, S/MIME, IP Security, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating payload, combining security association, Key Management, Web Security, Web Security Considerations, Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction, Introduction to Wireless security.

Unit V. **(12)**

Intruders, Viruses and Worms: Intruders, Intrusion detection, password management, Viruses and Related Threats, Distributed Denial of service attacks, Firewall Design Principles, Trusted Systems, Application layer firewalls, packet filtering firewalls, hybrid, virtual private network(VPN)

Text Books:

1. William Stallings, “Cryptography and Network Security”, Fourth edition, Prentice Hall, 2007.
2. Atul Kahate, “Cryptography and Network Security,” Tata McGraw-Hills, 2006.
3. Neal Krawetz, “Introduction to Network Security”,Thomson Business Press, 2007.

References:

1. Eric Maiwald, “Information Security Series”, “Fundamental of Network security”, Dreamtech press, 2004.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security: Private communication in public world”, Prentice Hall, India, 2002.

MSP344B Total Quality Management

Total teaching Hours/Semester: 60 *No of Lecture Hours/Week:04*

Unit I. **(12)**

Introduction

Quality - Definition & Dimensions of Quality, Quality Planning & costs - Analysis Techniques for Quality Costs

TQM -Basic Approach, Historical Review, TQM Framework, Awareness, Benefits of TQM, Barriers to TQM Implementation, Basic concepts of Total Quality Management, Awareness, Principles of TQM

Leadership – Characteristics & Role of TQM Leaders, Ethics, Leadership Concepts, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy,

Unit II. **(12)**

Principles & Practices of TQM

Customer satisfaction – Introduction, Customer Perception of Quality, Customer Feedback, Complaints, Service Quality, Customer Retention.

Employee Involvement – Introduction, Motivation, Employee Surveys, Empowerment, Teams, Suggestion system, Recognition and Reward, Gainsharing, Performance Appraisal, Unions & Employee Involvement & Benefits.

Continuous Process Improvement – Introduction, Process, Juran Trilogy, Improvement Strategies, Types Of Problems, PDSA Cycle, Kaizen, Six Sigma.

Supplier Partnership – Principles, Partnering, Sourcing, Supplier Selection, Certification, Supplier Rating, Relationship Development, **Performance Measures** –
Basic concept, Strategy, Performance Measure Presentation.

Unit III. **(12)**

Tools& Techniques of TQM

Benchmarking – Reasons to Benchmark, Benchmarking Process, Deciding what to benchmark.

Information Technology – Computers & Quality Function, The internet & other electronic communication, Information Quality Issues.

Quality Function Deployment (QFD) – The team, Benefits, process of QFD, House of Quality, **Quality By Design**– Rational, Team, Benefits, Communication Models, Implementation & tools.

Unit IV. **(12)**

Failure Mode & Effect Analysis (FMEA) - Intent, Team, Documentation, Stages, Other Types of FMEA.

Total Productive Maintenance – The Plan, Learning, Promoting the new Philosophy, Training, Improvement, Needs, Goal, Autonomous Work Groups.

Management Tools – Introduction, Forced Field Analysis, Normal Group Technique, Affinity, Tree, Matrix diagrams, Inter-realationship Di-graph Prioritzation Matrices, Process Decision Program Chart & Activity Network Diagram.

Unit V. **(12)**

Quality Systems

Quality Management System – ISO 9000:2000 Standards, Requirements, Implementation, Documentation, Quality (Internal & External) Audits, Benfits. Environmental Management System – ISO 14000 Series Standards, Requirements, Benefits, Relationship to Halth & Safety.

Statistical Process Control – Statistical fundamentals, Introduction to various diagrams used & the process.

Text Books :

1. Dale H.Besterfield, et al., *Total Quality Management*, Pearson Education, Inc.3rd Edition, 2003**.**

Reference Books :

1. Feigenbaum.A.V. "*Total Quality Managemen*t," McGraw-Hill, reprint 2007
2. Samuel K Ho, "TQM – *An Integrated Approach*", Kogan Page India (P) Ltd., (for Crest Publishing House – New Delhi, A Jaico Enterpise).2004
3. R.P. Mohanty, R.R.Lakhe, "Handbook of Total Quality Management", Jaico Publishing House, Mumbai.,2006

MSP344C Critical Systems Engineering

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction

Critical systems, Real time systems, Critical systems specifications

Foundations of systems Engineering

Systems engineering and the world of modern systems

What is systems engineering, Origins of systems engineering, Examples of systems requiring systems engineering, systems engineering view point , Systems engineering as a profession, The power of systems engineering

Unit II. **(12)**

Structure of complex system – Systems building blocks and interfaces, Hierarchy of complex systems, system building blocks, The system environment, Interfaces and interactions

The system Development Process – Systems engineering through the system life cycle, system life cycle, Evolutionary characteristics of the development process, the systems engineering method, testing throughout the system development

Systems engineering management – Managing systems development and risks, work breakdown structure (WBS), Systems engineering management plan(SEMP), Risk management, Organization of systems engineering, Systems engineering capability maturity assessment, systems engineering standards

Unit III. **(12)**

Concept Development Stage

Need Analysis – Originating a new system, operation analysis, Functional analysis, feasibility definition, needs validation, system operational requirements

Concept Exploration – Developing the systems requirements, operational requirements analysis, Performance requirements formulation, Implementation concept exploration, performance requirements validation

Concept Definition – Selecting the system concept, Performance requirement analysis, functional analysis and formulation, concept selection, concept validation, system development planning, system functional specifications

Unit IV. **(12)**

Engineering Development Stage

Advanced Development – Reducing program risks, Requirement analysis, functional analysis and design, prototype development, development testing, risk reduction

Engineering Design – Implementing the systems building blocks, requirement analysis, functional analysis and design, component design, design validation, configuration management,

Unit V. **(12)**

Integration and Evaluation – Integrating, testing and evaluating and evaluating the total system, test planning and preparation, system integration, development system testing, operation test and evaluation

Post Development Stage

Production – Systems engineering in the factory, Engineering for production, transition from development to production, production operations, Acquiring a production knowledge base

Operation and Support – Installing, maintaining and upgrading the system, Installation and test, In – Service support, Major systems upgrades: Modernization, Operational factors in Systems development

Text Books :

1. Alexander Kossiakoff, *Systems engineering Principles and practice*, and William N sweet publications, 2008.
2. Ian Sommerville, *Software engineering*, MacGraw Hill internal edition 5th Edition, reprint 2006.

Reference Books :

1. Tom Gilb, Lindsey Brodie ' *Competitive Engineering: A Handbook For Systems Engineering, Requirements Engineering, and Software Engineering Using Planguage'* Butterworth-Heinemann, 2005 ISBN 0750665076, 9780750665070
2. Peter M.Curtis '*Maintaining Mission Critical Systems in a 24/7 Environment (IEEE Press Series on Power Engineering)'* Wiley-IEEE Press (March 9, 2007)# Language: ISBN-10: 0471683744

MSP441A Wireless Communication

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Wireless LAN - Infra red vs radio transmission, infrastructure and ad-hoc network, IEEE 802.11 – System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, 802.11b, 802.11a, Newer developments; HIPERLAN – Historical: HIPERLAN 1, WATM, BRAN, HiperLAN2; Bluetooth – User scenarios, Architecture, Radio layer, Baseband layer, Link Manager protocol, L2CAP, Security, SDP, Profiles, IEEE802.15

Unit II. **(12)**

Mobile network layer - Mobile IP – Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPV6, IP micro-mobility support; Dynamic host configuration protocol, Mobile ad-hoc networks – Routing, Destination sequence distance vector, dynamic source routing, alternative metrics, Overview ad-hoc routing protocols

Unit III. **(11)**

Mobile transport layer - Traditional TCP – Congestion Control, slow start, Fast retransmit/fast recovery, Implications of mobility; Classical TCP improvements – Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP; TCP over 2.5/3G wireless networks, Performance enhancing proxies

Unit IV. **(12)**

Introduction WAP – WAP, A History of WAP, WAP Architecture, The Business Case for WAP, The Future of WAP, The User's point of View, Micro-Browser Issues, Design a Good WAP Application, The User interface-User interface Basics, low bandwidth, Small Screen Size, Text Entry Using the cache, Types of WML cards, The "Back" Button, Graphics, WAP

Unit V. **(13)**

Development Tools and Software - Editors and Emulators, Software Developer kits (SDKs) and Integrated Development, Converting Images, Working with WML - WML Basics, The "Hello World" Example, A Services Site Example,Interactivity: Forms and User Input - The Options Menu (select), Templates Revisited, Events, Variables, The Input Tag Additional Functionality with WML Script – Introducton to WMLScript, The rules of WMLScript, Variables, Operators, Control constructs, Reserved words, Functions, The standard libraries, Arrays, Prgmas, General Coding Principles,Database-Driven WAP - Active Server Pages, ActiveX Data Objects(ADO), A Dynamic WAP Application: Worldwide-dance-Web for WAP

Text Book:

1. Jochen Schiller, ”Mobile Communications”, Pearson Education India Ltd., 2nd edition, 2003
2. Dale BulBrook, “WAP – A Beginner’s Guide”, Tata McGraw Hill Edition, 2001

References

3. Rappaport, "Wireless Communications Principals and Practices' ,, Prentice Hall, 2nd Edition
4. YI Bing Un ,"Wireless and Mobile Network Architectures”, John Wiley
5. P. Nicopqlitidis, "Wireless Networks”, John Wiley
6. M. Richharia, "Mobile Satellite Communication: Principles and Trends”, Pearson Education

MSP441B Mobile Computing

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Introduction: Applications: A short history of wireless communication Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. **Medium Access Control**: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SOMA, FOMA, TOMA: Fixed TOM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, PRMA packet reservation multiple access, reservation TOMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access

Unit II. **(12)**

Telecommunication Systems: GSM: Mobile Services, System Architecture, radio interface, Protocols, Localization and Calling, Handover, Security, New Data Services; DECT; Systems Architecture; Protocol Architecture: TETRA, I UMTS and IMT-2000; UMTS Basic Architecture, UTRA FDD mode, UTRA TDD mode.

Satellite Systems: History, Applications, Basics: GEO, LEO, MEO, Routing, Localization. Handover, examples.

Broadcast Systems: Overview, Cyclic Repetition, Digital Audio; broadcasting: Multimedia object transfer Protocol; Digital Video broadcasting..

Unit III. **(12)**

Wireless LAN: Infrared vs. Radio Transmission, Infrastructure and Ad Hoc networks, IEEE 802.11: System Architecture, Protocol Architecture, Physical Layer, Medium Access Control Layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical Layer Channel access control. Sublayer, Medium Access control sublayer, Information bases and networking; Bluetooth: User Scenarios, Physical Layer, MAC layer, Networking, Security, Link management. **Wireless ATM:** Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol.

Unit IV. **(12)**

Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics. **Mobile Transport Layer:** Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile rcp, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit V.

Unit VI. **(12)**

Support for Mobility: File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagraram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language; WML script, Wireless telephony application, Examples "Stacks with WAP, Mobile databases, Mobile agents

Text Books

1. Schiller Jochen, "*Mobile Communications*", 2nd Edition, Addison Wesley, Pearson Education, 2003
2. Stallings William, "*Wireless Communications and Networks*", Prentice Hall-2005

Reference Books

1. Rappaport, "*Wireless Communications Principals and Practices*", 2nd Edition, Prentice Hall, 2006
2. YI Bing Un ,"*Wireless and Mobile Network Architectures*", John Wiley, 2008
3. P Nicopqlitidis, "*Wireless Networks'*, John Wiley, 2006
4. M. Richharia, "*Mobile Satellite Communication: Principles and Trends*", Pearson Education, 2006

MSP441C Software Architecture

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(11)**

Introduction.

Architecture Business Cycle : Origin of an Architecture , Software Processes and Architectural Business Cycle.

A good architecture, Software Architecture, What is & what it is not the software Architecture is Other points of view,

Architectural Pattern, Reference Models and Reference Architectures. The Importance of Software Architecture, Architectural structures & views.

A Case study in utilizing Architectural Structures.

Unit II. **(12)**

Creating An Architecture.

Understanding the quality Attributes - Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attributes Scenarios in practice, Other System Quality Attributes, Business Qualities, Architecture Qualities.

Achieving Qualities - Introducing Tactics - Availability, Modifiability, Performance, Security, Testability, Usability.

Relationships of Tactics to Architectural Patterns, Architectural Patterns and Style.

Unit III. **(11)**

Design and Documentation

Designing the Architecture- Architecture in the life cycle, Designing the Architecture, Forming the Team Structure, Creating the Skeletal System.

Documenting Software Architectures - Uses of Architectural Documentation, Views, Choosing the relevant views, Documenting a view, Documentation across views.

Unit IV. **(13)**

Analyzing Architecture

ATAM (Architecture **T**radeoff **A**nalysis **M**ethod) **–** A comprehensive method for architecture evaluation : Participants, outputs, phases of the ATAM,, **The Nightingale system - A case study in applying the ATAM.**

CBAM (Cost **B**enefit **A**nalysis **M**ethod) **–** A quantitative approach to architecture design decision making: Decision making context, basis for CBAM, Implementing CBAM, **A Case Study – The NASA ECS project.**

The World Wide Web – A case study in interoperability : Relationship to the Architecture Business Cycle, Requirements & Quality, Architectural Solution, The evolution of web-based e-commerce architectures, Achieving quality goals, Architecture Business Cycle today.

Unit V. **(13)**

Software Product Lines – Reusing Architectural Assets

Overview – Successful working, Scope, Architectures and Difficulties in software product lines.

Celsuis Tech – A Case study in product Line development : Relationship to the Architecture Business Cycle, Requirements & Quality, Architectural Solution.

Building systems from off-the-shelf components : Impact of components on Architecture, Architectural mismatch, Component-based design as search, ASEILM example.

Text Books:

1. Len Bass, Paul Clements, Rick Kazman, *Software Architecture In Practice,* 2nd Edition, Pearson Education Asia.2007

Reference Books:

1. Jeff Garland,Richard Anthony, *Large-Scale Software Architecture – A Practical Guide Using UML,* Wiley –dreamtech India Pvt.,Ltd.2006.
2. Pressman S Roger, *Software Engineering*, Mc Graw Hill International Editions, 4th edition, reprint 2007
3. Sommerville, Ian, *Software Engineering*, Addison Wesley, 5th Edition, reprint 2006.
4. Rumbaugh, James, *Object Oriented Modeling and design*, Pearson Education, New Delhi, 2005

MSP441D Neural Networks

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(11)**

Fundamental concepts and Model: Biological Neurons and their Artificial models, Models of Artificial Neural Networks, Neural processing Learning and Adaptation, Neural network Learning rules

Unit II. **(12)**

Single layer perceptron classifiers: Classification model, Features and decision regions, Discriminant functions, Linear machine and Minimum distance classification, Non parametric training concept, Training and Classification using the Discrete perceptron: algorithm and example, Single layer continuous Perceptron networks for linearly separable classifications, Multi-category Single layer Perceptron Networks

Unit III. **(12)**

Multilayer feedforward Networks: Linearly separable Pattern classification, Delta learning rule for Multiperceptron model, Generalised Delta learning rule, Feedforward recall and error back-propagation training, Learning factors, classifying and Expert layer networks, Functional link Networks

Unit IV. **(13)**

Single layer Feedback Networks: Basic concepts of dynamic systems, Mathematical foundations of Discrete-time Hopfield Networks, Mathematical foundations of Gradient type Hopfield networks, Transient response of continuous-time networks, Relaxation modeling in single layer Feedback networks

Associative memories: Basic concepts, Linear Associator, Basic Concepts of recurrent auto-associative memory

Unit V. **(12)**

Bidirectional associative memory, associative memory for spatio-temporal patterns.

Matching and self organizing networks: Hamming Net and MAXNET, unsupervised learning of clusters, counter propagation network, feature mapping Self-organizing Feature maps, cluster Discovery networks (ART1)

Text book:

1. Zacek M. Zurada ,*Introduction to Artificial Neural networks* Jaico Publishing -2006

Reference books:

1. Yagnanarayana, *Artificial Neural Networks* PHI Learning- 2007

MSP442A Data Storage Technologies

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

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. **(12)**

Storage Systems Architecture

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structurecomponents, 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 withstorage, Storage system connectivity protocols

Unit III. **(12)**

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 principales, standards, & network management principales, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (iSCSI, FCIP, iFCP), 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. **(12)**

Introductions to Information Availability

Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques

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 proactive management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview

Unit V. **(12)**

Securing Storage and Storage Virtualization

Define storage security. , List the critical security attributes for information systems, describe the elements of a shared storage model and security extensions, Define storage security domains, List and analyze the common threats in each domain, Identify different virtualization technologies, describe block-level and file level virtualization technologies and processes.

Reference Books:

1. Marc Farley Osborne, "*Building Storage Networks*", Tata Mcgraw Hill,2006
2. Robert Spalding, "*Storage Networks: The Complete Reference*", Tata Mcgraw Hill,2002
3. Meeta Gupta, *Storage Area Network Fundamentals* , Pearson Education Limited,2006
4. Gerald J Kowalski / Mark T Maybury ,*Information Storage & Retrieval Systems Theory & Implementation,* , BS Publications,2006
5. Thejendra BS ,*Disaster Recovery & Business Continuity* -, Shroff Publishers & Distributors,2008
6. Barb Goldworm / Anne Skamarock, *Blade Servers & Virtualization*, Wiley India Pvt.Ltd,2006
7. EMC students guide

MSP442B Concurrent and Distributed Systems

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Concurrent Programming : Introduction, Interleaving, Atomic Instruction, Correctness.The Mutual Exclusion Problem Introduction, First, SEcond, Third Attempt, Dekker's Algorithm, Mutual Exclusion for Nprocesses. Semaphores-Introduction, Invariants, Definition, Producer Consumer Problem, Infinite Buffers, Infinite Buffers, Producer-Consumer with Binary Semaphores.

Unit II. **(12)**

Monitors: Introduction,Producer-Consumer Problem,Eumulation of Semaphores by moonitors, Eumulation of monitors by semaphores, The Problem of the Readers and Writers, Correctness ProofThe Problem of Dining Philosophers- Introduction, Solution using Semaphores

Unit III. **(12)**

Distributed Programming: Introduction,Synchronous or Asynchronous Communication,Process Identification,Data flow,Process Creation.Ada :Introdcution,The Select Statement,Dynamic Task Creation,Priorities and Entry Families.Linda::Introduction,Matrix Multiplication in Linda.

Unit IV. **(12)**

Distributed Programming: Introduction,Synchronous or Asynchronous Communication, Process Identification, Data flow, Process Creation.Ada :Introdcution,The Select Statement, Dynamic Task Creation, Priorities and Entry Families.Linda::Introduction, Matrix Multiplication in Linda.

Unit V. **(12)**

Distributed Mutual Exclusion:Introduction,Outline of Algorithm,Details of Algorithm, Correctness of Algorithm. Distributed Termination :Introduction, The Dijkstra-Scholten Algorithm, Snapshots. The Byzantine General Problem: Description of problem, Algorithm for four Genreals. Impossibility of three Genreals.

Unit VI. **(12)**

Single Processor Implementation: Memory Allocation, process Control Blocks, Priorities. MultiPProcessor Implementation: Implementation of Linda, Ada on Distributed Sysrem, Real Time Programming: Synchronous and Asynchronous Systems, Interruptsand Polling, Interrupt handlers and Software Processes, Nested Interrupts, Schedulling Algorithm for Real Time, Priority Inversion.

Text Books

1. 1.M.Ben *Ari Principles of Concurrent and Distributed Programming* ,PHI,reprint 2006
2. Tanenbaum, *Distributed Operating System*, Pearson Education, Reprint 2005.

Reference Books

1. Mukesh Singha, Niranjan Shivratri,*Advanced Operating Systems*, Tata MCGrawHill, reprint 2005

MSP442C Web Engineering

Total teaching Hours/Semester: 60 ***No of Lecture Hours/Week: 04***

Unit I. **(12)**

Web-Based Systems-The Web—Web Apps-A Philosophical View.
Web Engineering-introduction to Web Engineering--The Components of Web Engineering- Web Engineering Best practices. .A Web Engineering Process-Defining the Framework-Incremental Process Flow-Generic actions and task for the WebE Framework.- Umbrella Activities.

Unit II. **(12)**

The Modeling Activity-Modeling as a Concept-The Model creation-Modeling Frameworks-Is -Modeling Languages-Existing modeling approaches.Analysis Modeling for WebApps-Understanding Analysis in the Context of WebE- Analysis Modeling for WebApps-Understanding the Users- The Content Model- The Interaction Model-The Functional model-the configuration model-relationship-Navigation analysis.

Unit III. **(12)**

WebApp Design‑Design for WebApps- Design Goals-Design and WebApp Quality-Design process- Initial Design of the Conceptual Architecture-Initial Design of the Technical Architecture.Interaction Design‑Interface Design Principles and Guidelines- Interface Design Workflow-Interface Design Preliminaries--Interface Design Steps-Aesthetic Design-usability-design issues.

Unit IV. **(12)**

Information Design-Information Architecture- Organizing Content-Structuring the Information Space-Blueprints: Adding details to a structure-Accessing information-Wireframe Models-Navigation Design-summarizing the design process.Functional Design-WebApp Functionality-The Nature of WebApps functionality- Functional Design in the Design Process- Functional architecture- Detailed Functional Design- State Modeling.

Unit V. **(12)**

Construction and Deployment-construction and deployment within the WebE process-Construction-construction principles and concepts-deployment-construction and the use of components-components-level Design Guide lines-Component Design steps.Design patterns-Patterns: understanding the concept-WebApp patterns:Desingn focus and granularity-pattern repositories-example patterns.Technologies and tools.-General issues-implementationtools and technologies-development tools and technologies.

Text Books

1. Roger S Pressman and David Lowe "*WEB ENGINEERING" A Practitioner's Approach*,TATA McGRAW HILL,special Indian edition 2008.

Reference Books

1. Emila Mendes, Nile Mosley, *Web Engineering* , Springer, 2006

2.Gerti Kappel, Birgit Proll, Siegfried Reich, Werner Retschizegger, *Web Engineering: The Descipline of Systematic Development of Web Applications*, John Wily & sons publications, 2006.

MSP451 Industry Project

It is a full time project to be taken up either in the industry or in an R&D organization.