MASTER OF COMPUTER APPLICATIONS (MCA) - COURSE STRUCTURE

(Effective - 2010 Admission onwards)

Semester I

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2101	Combinatorics & Graph Theory	C	50	50	4
CAS2102	Computer Organization	C	50	50	4
CAS2103	Programming in C	C	50	50	3
CAS2104	Discrete Mathematical Structures	C	50	50	3
CAS2105	Computer Based Optimization	C	50	50	3
CAS2106	Lab 1 + Viva-Voce	C	50	50	2
Total					19

Semester II

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2201	Computer Graphics	C	50	50	3
CAS2202	Data Structures using C	C	50	50	3
CAS2203	Object oriented Programming with C++	C	50	50	4
CAS2204	Applied Numerical Analysis	C	50	50	3
CAS2205	Elective 1	E	50	50	3
CAS2206	Lab 2 + Viva-Voce	C	50	50	2
Total					18

Semester III

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2301	System Software	C	50	50	3
CAS2302	Data Base Management Systems	C	50	50	3
CAS2303	Computer Algorithms	C	50	50	4
CAS2304	Operating System	C	50	50	4
CAS2305	Elective 1	E	50	50	3
CAS2306	Lab 3 + Viva-Voce	C	50	50	2
Total					19

Semester IV

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2401	Software Engineering	C	50	50	3
CAS2402	Artificial Intelligence	C	50	50	3
CAS2403	Elective 1	E	50	50	3
CAS2404	Elective 2	E	50	50	3
CAS2405	Mini Project Work	C	50	50	3
CAS2406	Lab 4 + Viva-Voce	C	50	50	2
Total					17

Semester V

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2501	Networks and Data Communications	C	50	50	4
CAS2502	Simulation and Modelling	C	50	50	3
CAS2503	Elective 1	E	50	50	3
CAS2504	Elective 2	E	50	50	3
CAS2505	Elective 3	E	50	50	3
CAS2506	Seminar	C	100	0	3
	Viva-voce (Internal)	C	100		
Total					19

Semester VI

Course Code	Paper	C/E	Marks		Credit
			Internal	External	
CAS2601	Project Work and Viva-Voce	C	200	200	16
Total					16

C – Core E - Elective

List of Electives

Second Semester

E1 - Number Theory.

E2 - Number Theory and Cryptography.

E3 - Applied Probability and Statistics.

Third Semester

E4 - Web Commerce Technologies.

E5 - Object Oriented Design.

E6 - Security in Computing.

E7 - Embedded Systems.

E8 - Linux System Programming.

E9 - Basic Java Programming.

Fourth Semester & Fifth Semester

E10 - Linux Internals.

E11 - Compiler Design.

E12* - Advanced JAVA Programming

E13* - Advanced JAVA Mobile Programming

E14* - Web enabled JAVA Programming.

E15 - Data Mining (prerequisites CAS 220x-Applied Probability and Statistics).

E16 - Software Project Management.

E17 - Cryptography and Network Security.

E18 - Intelligent Systems.

E19 - Visual Programming VB.Net.

E20 - Digital Image Processing.

E21 - Software Quality.

* Only one of the electives from E12, E13 and E14 is allowed to select during the IV and V semesters.

CAS 2101 - Combinatorics and Graph Theory

Unit 1

Selections and Binomial Coefficients**:** Permutation and Combination, Ordered Selections, Unordered Selections, Pairing Problems, Pairing within a set, Pairing between sets, An optimal assignment problem, Gale's optimal assignment problem, Recurrence relations, Generating functions, The inclusion-exclusion principle, Rook polynomials.

Unit 2

Block designs and Error-correcting codes: Block designs, square block designs, Hadamard configurations, Error-correcting codes, Steiner systems and sphere packings, Steiner systems, Leech's lattice.

Unit 3

Graphs and trees: Incidence and degree, Isomorphism, Subgraphs and union of graphs, Connectedness, Walks, Paths and circuits, Components, Connectedness Algorithm, Shortest path Algorithms, Eulerian graph, Hamiltonian graph- necessary and sufficient conditions, Traveling salesman problem, Bipartite graphs, Properties of trees, Centre of a tree, Rooted and binary trees, Spanning trees, Fundamental circuits, Spanning trees of a weighted graph, cutsets and cut-vertices, Fundamental cutsets, connectivity, separable graphs, Network flows, Max-flow Min-cut theorem

Unit 4

Planar graphs, combinational and geometric duals, Kuratowski's graphs, Detection of planarity, thickness and crossings, Matrix representations of graphs, Incidence matrices, Adjacency matrices and their properties, Chromatic number, Chromatic polynomial, the five color theorem, the four problem.

Unit 5

Directed graphs: Binary relations, directed graphs and Connectedness, Directed trees, Arboresence, Polish method, Tournaments, Counting labeled trees, Cayley's theorem, Counting methods, Polya Theory, Applications of graphs in Computer Science.

Text Books:

1. Ian Anderson, 'A First Course in Combinatorial Mathematics', Clarendon Press, Oxford, 1974
2. Deo, N, 'Graph Theory with Applications to Engineering and Computer Science', Prentice-Hall Inc.,1974

References:

1. Harrary F, 'Graph Theory', Addison Wesley Publ. Comp., 1972.
2. Trembley J P & Manohar R P 'Discrete Mathematical Structures with Applications to Computer Science', Mc-Graw Hill, 1975.
3. Krishnamurthy V, 'Combinatorics: theory and applications', West Press Pvt. Ltd 1985.
4. Doerr A & Levasseur K, 'Applied Discrete Structures of Computer Science', Galgotia Pub.Pvt.Ltd, 1986

*****

CAS 2102 - Computer Organization

(Revised June 2008)

Unit 1

Introduction – Basic Structure of Computers – Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multicomputers. Number System and Digital Electronics – Introduction, Representation of negative number, Conversion of Real Number, Binary Coded decimal, Hexadecimal Number System, Octal Number System, ACII and ISCII codes, EBCDIC Code, logic Gates, Combinational and sequential circuits, Boolean Algebra, Flip-Flops, Latch, Register, Shift Register, Encoders/decoders, Code converters, Counters.

Unit 2

Machine Instructions and programs – Memory locations and addresses, Memory operations, Addressing modes, Assembly Language, Basic I/O operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions. Input-Output organization – Accessing I/O devices, Interrupts, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

Unit 3

The Memory System – Some Basic Concepts, Semiconductor **RAM** Memories, Read-Only Memories, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Arithmetic- Addition and Subtraction of signed numbers, Multiplication of positive, numbers, Signed Operand Multiplication, Integer division, Floating point numbers and Operations. Logic circuits - Basic Logic Functions, Synthesis of logic functions, Minimization of logic, Synthesis with **NAND** and **NOR** Gates, Practical Implementation of logic gates.

Unit 4

Basic processing Unit – Fundamental Concepts, Execution of a complete instruction, Multiple-bus organization, Hardwired control, Microprogrammed control. Ipelining – Basic concepts, Data hazards, Instruction Hazards, Influence on instruction sets, superscalar Operation, Datapath and control consideration
Computer Peripherals – Input Devices, Output devices, Serial Communication Links.

Unit 5

Typical Micro processors – Intel 8086, Intel 80486, Intel Pentium, Cyrix Microprocessors, **AMD** Microprocessors, 8086 Instructions, Latest Processors.

Text Book:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 'Computer Organization'. 5th Ed. Tata McGraw-Hill, 2002.
2. B.Ram, 'Fundamentals of Microprocessors and Micro Computers'. 5th Ed. Dhanpat Rai Publications, 2001.

References:

1. Tanenbaum A.S, 'Structured Computer Organization'. 5/e, Prentice Hall of India 2006, (3rd 1990)
2. Mano M M, 'Computer System Architecture'. 3rd Ed. Prentice Hall of India, 1993.
3. Hayes, 'Computer Architecture and Organization', 2nd Ed. McGraw Hill, 1988.
4. Sloan M E, 'Computer hardware and Organization', Science Research Associates, 1976.

*****

CAS 2103 - Programming in C

(Revised June 2008)

Unit 1

Introduction - What is C, General Concepts, How C looks. C Character Set, Keywords Data Types - Primary Data types, sizes.Identifiers, Variables – Declaration of variables, initialization.Constants, Symbolic Constants.

Unit 2

Storage Classes - Storage Class Specifiers, Scope Rules, Declaring variables using storage classes. Operators - Arithmetic operators (Binary operator), Unary Operators, Relatonal and Logical operators, Increment and Decrement operators, Bitwise operators, Assignment operators and expressions. Conditional operator. Operator Precedence and associativity.Data type Conversions –Implicit and Explicit Conversions. Control Structures – Statement and Blocks- if else, else if, switch.Loops – while, for, do while. Break and Continue. Go to and labels

Unit 3

Functions –General concept of functions,Function returning non-integers, Call by value, Call by reference, Recursive functions .Preprocessors - Concept of header files,File inclusion, Macro substitution, Conditional inclusion. Arrays – General Concepts. One dimensional Arrays, Array Declaration, initialization, Multi dimensional arrays. Structures and Unions-Basics of Structures, Structures and Functions, Arrays of Structures, Pointers to Structures, Self-Referential Structures. Table Lookup, Typedef, Unions, Bit-fields.

Unit 4

Introduction to Pointers-Pointers and Addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, Character Pointers and Functions, Pointer Arrays; Pointers to Pointers, Initiallization of Pointer Arrays., Pointers vs. .Multidimensional Arrays. Command-line Arguments, Pointers to function, Complicated Declarations

Unit 5

Files -File Access, Error Handling-Stderr and Exit, Line input and output, Miscellaneus Functions.

Text Book:

Kernighan, Brain W & Ritchie, Dennis M, 'The C Programming Language'. 2nd Ed. Prentice Hall, 2007.

References:

1. Les Hancock & Morris Krieger, 'The C Primer', McGraw-Hill, 1987
2. Yashavant Kanetkar , 'Let Us C', BPB Pulication. 6th Ed. 2005
3. Byron Gottfried, 'Programming with C', 2nd Ed. Schaum's outline series, 2002.

CAS 2104 - Discrete Mathematical Structures

(Revised July 2010)

Unit 1

Foundations: Sets, Logic and Algorithms – Sets, Mathematical Logic, Validity of Arguments. Quantifiers and First – Order Logic, Proof Techniques, Algorithms, Integers and Mathematical Induction, Linear Diophantine Equations, Relations, Equivalence relations, Equivalence Classes and Partitions, closures, Partially ordered sets, Lattices.

Unit 2

Matrices and Closures of Relations, Matrices, The Matrix of a Relation and Closures, Binary Operations, Counting Principles, Basic Counting Principle, Pigeon hole Principle, Permutations, Combinations, Generalized Permutations and Combinations.

Unit 3

Recurrence Relations. Sequences and Recurrence Relations, Linear Homogeneous Recurrence Relations. Linear Non homogeneous Recurrence Relations.

Unit 4

Boolean Algebra and Combinatorial Circuits. Two-element Boolean Algebra, Boolean Algebra, Logical Gates and Combinatorial Circuits, Karnaugh Maps and Minimization of Boolean Expressions.

Unit 5

Finite Automata and Languages – Finite Automata and Regular Languages, Deterministic Finite Automata, Pumping Lemma, Nondeterministic Finite Automata, Grammars and Languages.

Text Book:

D.S.Malik & M.K Sen, 'Discrete Mathematical Structures: Theory and Applications, Cengage Learning, 2008.

References:

1. Ralph P.Grimaldi & B.V.Ramana, 'Discrete and Combinatorial Mathematics',5th Ed. Pearson, 2008.
2. Trembley J.P. & Manohar R.P, 'Discrete Mathematical Structures with Application to Computer Science', Mc.Graw Hill, 2007.
3. John E.Hopcroft & Jeffery D.Ullman, 'Introduction to Automata Theory, Languages and Computation', Narosa Publishing House, 2008.
4. John Truss, 'Discrete Mathematics for Computer Scientists', 2nd Ed. Pearson, 2001.

CAS 2105 - Computer Based Optimization

Unit 1

Programming- Mathematical Model, assumptions of linear programming, Principles of simplex method, Applications, Duality Dual simplex method, sensitivity analysis

Unit 2

Special types of Linear programming problems- Transportation and assignment problems

Unit 3

Integer Programming: Introduction, Branch and found Techniques, Binary Linear programming, Assignment & Travelling salesman problems.

Unit 4

Dynamic programming: Deterministic and Probabilistic Dynamic programming

Unit 5

Queuing Model: Specification and measure of queuing systems. Structures of basic queuing systems – Definition and classification of stochastic processes- discrete- time Markov Chains – Continuous Markov Chains- Birth- death processes.

Birth-death queuing systems: The classical system-Discouraged arrivals-

Infinite number of servers (M/M/n)-m server case M|M/m) – Finite storage(M/M/I/K)- Finite customer population with single servers (M/M/I/M)-15.

References:

1. Hillier F S & Liberman G J, 'Introduction to Operations Research', 2nd Ed., Holden Day Inc. London, 1974.
2. Taha, 'Operations Research', 3rd Ed., Mc Millan Publishing Company, 1982.
3. Beightler C S & Philips D T, 'Foundations of optimisation', 2nd Ed., Prentice Hall, 1979.
4. Mc Millan Claude Jr, 'Mathematical Programming', 2nd Ed. Wiley Series, 1979.
5. Srinath L.S, 'Linear Programming', East-West, New Delhi, 1982
6. Churchman C W & Arnchoff E L, 'Introduction to Operations Research', John Wiley and sons.
7. Gillet B G, 'Introduction to Operation Research: a computer oriented algorithmic approach', Mc Graw Hill Book Comp. 1976.

****

CAS 2201 - Computer Graphics

Unit 1

Overview of Graphics Systems: Video display devices, Raster Scan Systems, Random Scan Systems, Graphics Software. Output Primitives: Points and Lines, Line-Drawing Algorithms, Cicrcle-generating algorithms, Elipse generating algorithms, Filled-Area primitives, character generation.

Attributes of output primitives: Line, curve, area-fill, Scharacter and bundled attributes, Antialiasing

Unit 2

Two Dimensional Geometric Transformations: Basic transformations, Matrix representation and Homogeneous coordinates, Composite transformations, Other transformations, Transformations between coordinate systems, Affine transformations, Raster methods for transformations. Two-dimensional Viewing: The viewing pipeline viewing coordinate reference frame, window-to-viewport coordinate transformation, Clipping operations, Line clipping, polygon clipping, curve, text and exterior clipping.

Unit 3

Structures and hierarchical modeling: Basic modeling concepts, Hierarchical modeling with structures. Graphical User interfaces and interactive input methods: Input of graphical data, Input functions, interactive picture-construction techniques. Three Dimensional Concepts and object representations: Three-dimensiuonal display methods, Spline Representations, Beizer curves and surfaces, Sweep representations, Constructive solid-geometry methods, Octrees, BSP trees, Fractal-Geometry methods: Fractal-Generation Procedures, Classification of Fractals, Fractal dimension, Geometric construction of Deterministic Self-similar fractals, Affie Fractal-Construction Methods, Random Midpoint-Displacement Methods, Shape Grammars and other procedural methods. Physically based modeling, Visualization of data sets.

Unit 4

Three –Dimensional Geometric and modeling transformations and viewing: Translation, Rotation, Scaling, Other transformations, Composite Transformations, Modeling and coordinate transformations, Viewing Pipeline, Viewing Coordinates, Projections, Viewing volumes and general projection transformations, Clipping
Visible Surface-detection methods: Classification, Back-face detection, a buffer method, scan-line method, Depth-sorting method, BSP tree method, are-subdivision method. Wire frame methods.

Unit 5

Illumination models and surface-renderingmethods: Light sources, basic illumination models, Polygon-Rendering methods,Ray-tracing methods, Computer Animation:Design of Animation Sequence, Raster animations, Key-frame systems – Morphing, Motion specifications.

Text Book: Hearn, Donald & Baker, M Pauline, 'Computer Graphics'. 2nd Ed., Pearson Education, 2002.

References:

1. Foley, James D et.al., 'Introduction to Computer Graphics', Addison Wesley, 1994.
2. Newmann, William M & Sproull, Robert F, 'Principles of Interactive Computer Gaphics', Mc Graw Hill, 1981.

*****

CAS 2202 - Data Structures Using C

Unit 1
Arrays. Lists, Stacks, Queues, applications of queues-simulation, implementation details.

Unit 2
Trees-Ordered trees, Binary search tree, AVL tree. RED BLACK tree. Threaded binary trees- inorder, postorder and preorder – traversal, insertion and deletion.

Unit 3
Heap-Binomial Heap, Fibonacci Heap, Hash functions.

Unit 4
Recursion - Backtracking - Removal of recursion – Examples

Unit 5
Sorting algorithms – Quick sort, Radix sort, Heap sort, Merge sort and Count sort

Text Book:

Horowitz E & Sahni S, 'Fundamentals of data structures', Computer Science press, 1978.

References:

1. Wirth,Niclaus, 'Algorithms + Data structures = Programs', Prentice Hall International, 1976.
2. Knuth D, 'The Art of Computer Programming Vols.1 & 2', Addison - Wesley, 1970-80.
3. Tanenbaum, A.M & Augenstein, M J, 'Data Structures with Pascal', Prentice Hall International, 1985.

*****

CAS 2203 - Object Oriented Programming with C++

(Revised June 2008)

Unit 1

Introduction to Object oriented paradigm, Basic concepts of Object oriented programming, Applications of OOP. Introduction to C++ - I/O Streams, Datatypes and declarations, Operators, Arrays, Strings, Control flow, Storage classes and linking, File streams, Pointers, Reference variables, Functions, Inline functions, Default arguments, Function Overloading.

Unit 2

Classes and objects, Static members and functions, Const objects and Const member Functions, Friend functions, Object initialization and cleanup-Constructors, Different types of constructors, Destructors, Container classes.

Unit 3

Dynamic Object creation-new and delete Operators, this pointer, Operator overloading. Inheritance - Different types of inheritance, Abstract classes, Inheritance versus Composition.

Unit 4

Polymorphism and virtual functions, Pure virtual functions, Abstract classes, Dynamic binding, Casting, Object slicing.

Unit 5

Templates-Function Templates, Class templates, Overloading of templates, Exception handling, Namespace.

Text Book:

1. Venugopal K R, Rajkumar & Ravishankar T, 'Mastering C++', Tata Mc Graw Hill, 1999.

References:

1. Bjarne Stroustrup, 'The C++ programming language', Pearson, 2000.
2. Herbert Schildt, 'The Complete Reference C++', Tata Mc Graw Hill, 2003.
3. Robert Lafore, 'Object Oriented Programming in C++', Galgotia, 2000.

****

CAS 2204 - APPLIED NUMBERICAL ANALYSIS

Unit 1

Solving Nonlinear Equations:- Improved Ideal Gas Laws, Interval Halving (Bisection) Revisited. Linear Interpolation Methods. Newton's Method, Muller's Method. Fixed-Point Interation. Newton's Method for Polynomials, Bairstow's Method for Quadratic Factors. Multiple Roots.

Unit 2

Solving Sets of Quations: Computing the forces in a Planar Truss, Matrix Notation. The Elimination Method. Gauss and Gauss-Jordan methods, Pathology in Linear Systems-Singular Matrices. Determinants and Matrix Inversion, Norms. Condition numbers and Errors in Solutions. Interative Methods. The relaxation Method. Systems of Nonlinear equations.

Unit 3

Interpolation and Curve Fitting: An Interpolation Problem. Lagrangian Polynomials. Divided Differences, Evenly Spaced Data. Interpolating with a cubic Spline, Bezier curves Polynomials Approximation of surfaces, Least-Squares Approximations.

Unit 4

Numerical Differentiation and Numerical Integration: and B-Spline Curves, Getting Derivatives and Integrals Numerically, Derivatives from Difference Tables, Higher –Order Derivatives, Extrapolation Techniques, Newton-Cotes Integration formula. The Trapezoidal Rule-A Composite Formula. Simpson's Rules, Gaussian Quadrature, Adaptive Integration, Multiple Integrals, Multiple Integration with Variable Limits.

Unit 5

Numerical Solution of Ordinary Differntial equations: The spring-Mass Problem. A variation. The Taylor-Series Method. Euler and modified Euler Methods. Runge-Kutta Methods. Multistep Methods. Milne's Method. The Adams-Moulton Method, Multivalued Methods. Convergence Criteria, Errors and error Propagation Systems of Equations and Higher –Order

Equations, Comparisons of Methods/Stiff Equations.

Note: Assignment may be given to develop programs in FORTRAN for the various numerical methods

Text Book: Curtis F Gerald, Patrick O Wheatley, 'Applied Numerical Analysis', 5th Ed. Addison – Wesley, 1994.

References:

1. Stoer, Bullrich, 'Computer Oriented Numerical Methods', Springer Verlag, 1980
2. Krishamurthy, E.V & Sen S.K, 'Computer Based Numerical Algorithms', East West Press, 1984
3. Alfi A A, 'Statistical Analysis: A Computer Oriented approach', Acadamic Press, Ic, 1979.
4. Scalzo F, 'Elementary Computer Assisted Statistics', Van Nostrand reinherd Co. Limited, 1978.
5. Rajaraman V, 'Computer Oriented Numerical Methods', Prentice Hall India, 1980.

*****

CAS 2301 - System Software

Unit 1

Assemblers:- Basic Assembler Functions, Machine-Dependent Assembler Features, Machine-Independent Assembler Features, Assembler Design Options, Implementation Examples

Unit 2

Loaders and Linkers: - Basic Loader Functions, Machine-Dependent Loader Features, Machine-Independent Loader Features. Loader Design Options, Implementation Examples, MS-DOS Linker.

Unit 3

Macro Processors: - Basic Macro Processor Functions, Machine-Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

Unit 4

Compilers: - Basic Compiler Functions, Machine-Dependent Compiler Features, Machine-Independent Compiler Features, Compiler Design Options, Implementation Examples.

Unit 5

Operating systems:- Basic Operating System Functions. Machine-Dependent Operating System features, Machine-independent Operating System features. Operating System Design Options, Implementation Examples.

Text Book:

Leland L.Beck, 'System Software: An introduction to Systems Programming', 3rd Ed., Addison Wesley 1997.

References:

1 Donovan J J, 'Systems Programming', Mc Graw Hill, 1972.

2 Dhamdhere D.M, 'Introduction to System Software', Tata Mc Graw Hill, 1986.

3 Johns.Robin & Stewart, 'The art of Programming', Narosa Pub. House,

4 Cooper, Mullish, 'The spirit of C an introduction to modern programming', Jaico Publ. House, New Delhi 1987.
5 Kenneth A, 'C Problem Solving and Programming' Prentice Hall International.
.
6 Kernighan B.W & Ritchie D M, 'The C Programming Language' Prentice Hall India, 2006.
7 Schildt, Herbert, 'C made Easy', Mc Graw Hill, 1987.
.
8 Kaicker S, 'Programming with C', Mc Millan India, 1989.
.

******

CAS 2302 - Database Management Systems

(Revised June 2009)

Unit 1: Introduction

Introduction to File and Database systems- History- Advantages, disadvantages- Data views – Database Languages – DBA – Database Architecture – Data Models – Keys – Mapping Cardinalities

Unit 2: Relational Model

Relational Algebra and calculus – Query languages – SQL – Data definition – Queries in SQL – Updates – Views – Integrity and Security – triggers, cursor, functions, procedure – Embedded SQL – overview of QUEL, QBE

Unit 3: Database Design

Design Phases – Pitfalls in Design – Attribute types –ER diagram – Database Design for Banking Enterprise – Functional Dependence – Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF).
File Organization – Organization of Records in files – Indexing and Hashing.

Unit 4: Transaction Management

Transaction concept – state- Serializability – Recoverability- Concurrency Control –Locks- Two Phase locking – Deadlock handling – Transaction Management in Multidatabases

Unit 5: Current Trends

Object-Oriented Databases- OODBMS- rules – ORDBMS- Complex Data types – Distributed databases – characteristics, advantages, disadvantages, rules- Homogenous and Heterogenous- Distributed data Storage – XML – Structure of XML Data – XML Document- Data mining- Data warehousing- Applications and Challenges in Multimedia databases- Overview of Biological databases- Mobile databases.

Text Book:

Abraham Silberschatz, Henry F. Korth & S. Sudarshan, 'Database System Concepts**'**. 5th Ed., McGraw Hill International Edition, 2006.

References:

1. Philip J. Pratt, Joseph J Adamski, 'Database Management Systems', Cengage Learning, 2009.
2. Rameez Elmasri, Shamkant B. Navathe, 'Fundamentals of Database Sytems', 5th Ed., Pearson Education, 2009.
3. Arun K Majumdar, Pritimoy Bhattacharyya, 'Database Management Systems', TMH, 2009

4. ISRD group, 'Introduction to Database Management Systems', TMH, 2008
5. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', McGraw Hill International Edition, 2003.
6. Ramon A Mata-Toledo, Pauline K Cushman, 'Database Management Systems', TMH, 2008.

*****

CAS 2303 - Computer Algorithms

Unit 1

Growth of functions, Asymptotic notations, Standard notations & common functions, Summations, Recurrences, The efficiency of Algorithms, Analysis of Algorithms Elementary Data Structures – Hash tables, Binary search trees – AVL tree, Red-black tree, B-Trees, Augmenting Data Structures, Binomial heaps, Fibonacci Heaps, Data Structures for disjoint sets.

Unit 2

Dynamic Programming techniques – Principle of Optimality, Matrix – Chain multiplication, Knapsack Problem. Greedy Algorithms – An activity selection problem, Huffman codes, A task scheduling problem. Divide & Conquer Strategy-Closest pair of points, Back tracking algorithms.

Unit 3

Graph Algorithms – BFS, DFS, Topological sort, strongly connected components, Flow networks, Branch & Bound Algorithms

Unit 4

Number Theoretic Algorithms – Matrix multiplication, Inverting matrices, Primality testing, Integer factorization

Unit 5

Computational Complexity – sorting, The complexity of sorting, NP completeness

Text Book:

Thomas H Cormen, Charles E Leiserson, & Ronald L Rivest, 'Introduction to Algorithms', 2nd Ed. Prentice Hall of India Private Limited, New Delhi, 2001.

References:

1. Sahni, 'Data Structures, Algorithms and Applications in C++', Tata Mc-Graw Hill, 1998.
2. Gilles Brassard & Paul Bratley, 'Fundamentals of Algorithmics', Prentice-Hall of India, 2007.
3. Goodman S E & Hedetnieni, 'Introduction to the Design & analysis of Algorithms', Mc-Graw Hill, 2002.
4. Horowitz E & Sahni S, 'Fundamentals of Computer Algorithms', Galgotia Publications Pvt. Ltd, 2004
5. Aho A V, Ullman, J D & Hopcroft J E, 'The Design and Analysis of Computer Algorithms', Addison Wesley, 2000.
6. Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C++', Pearson, 2001
7. Knuth D E, 'The art of computer programming Vol 1: Fundamental Algorithms', Pearson, 2008.

*****

CAS 2304 - Operating System

Unit 1

Operating System Basics, **Computer System Structures**: Computer System Operations, I/O Structure, Storage Structure, Storage hierarchy, Hardware Protection, Network Structure, **Operating System Structures**: System Components, OS Services , System Calls, System Programs, System Structure, **Process**: Process concepts, Process scheduling, Operation on processes, IPC, Communication in client-server system, **Threads:** Overview, Multithreading models, Threading issues, Pthreads.

Unit 2

CPU Scheduling: Basic concepts, Scheduling criteria, scheduling algorithms, Multiple processor scheduling, Real time scheduling, Algorithm evaluation, **Process Synchronization:** Critical section problems, Synchronization hardware, Semaphore, Classic problems of synchronization, Critical regions, Monitors, Atomic transaction, **Deadlocks:** system model, Deadlock characterization, Methods of handling deadlocks, Deadlock prevention, deadlock avoidance, Deadlock detection, Recovery from deadlock.

Unit 3

Memory Management: Background, swapping, contiguous memory allocation, Paging, Segmentation, Segmentation with paging. **Virtual Memory:** Background, Demand Paging, Process Creation, Page replacement, Allocation of frames, Thrashing**, File System Interface and Implementation:** File Concept, Access Methods, Directory Structure, File-system Mounting, File Sharing, Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation methods, Free-space Management, Efficiency and Performance, Recovery, Log-Structured File System, NFS.

Unit 4

I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/ O to Hardware Operations, Streams, Performance. **Mass Storage Structure:** Disk structure, Disk Scheduling, Disk Management, Swap-space Management, RAID structure, Disk Attachment, Stable-Storage Implementation, Tertiary-storage structure. **Distributed System Structure**: Background, Topology, Network types, Communication, Communication protocols, Robustness, Design Issues.

Unit 5

Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Evocation of Access rights, Capability-Based system, Language-Based Protection. **Security:** The Security Problem, User Authentication , Program Threats, System Threats, Securing Systems and Facilities, Intrusion Detection, Cryptography, Computer-Security Classifications .**Case Study:** The Linux System.

Text Book: Silberschatz, Galvin, Gagne, 'Operating System Concepts', 6th Ed. Wiley- India, 2003

References:

1. Andrew S Tanenbaum, 'Operating Systems: design and implementation', 3rd Ed. Pearson, 2006.

2. Williams Stallings, 'Operating Systems: Internals and Design Principles', 5th Ed., Pearson, 2006.

****

CAS 2401 - Software Engineering

Unit 1

Introduction to software engineering – Some size factors. Quality and productivity factors. Managerial issues. Project Management Concepts – The Management Spectrum, People, The Product, The Process, The Project is WSHH Principle. The Process. The Software Process Models, the Linear Sequential Model. The Prototyping Model, The RAD Model, Evolutionary Software Process Model.

Unit 2

Planning a software Project – Defining the problem, Developing a solution strategy, Planning the Development Process – The phased life-cycle model, Milestones Documents and reviews, the Cost

Model. The Prototype Life-Cycle Model, Successive versions, Planning an organizational structure, Other Planning activities. Software Cost estimation Techniques: Expert Judgement, Delphi Cost Estimation. Work Breakdown Structures, Algorithmic cost models.Requirements :functional and non-functional requirements, User requirements, System requirements the software requirements document.

Unit 3

Software Configuration Management – The Software Configuration Management, The SCM Process Identification of Objects in Software Configuration, version Control, change control, configuration Audit. Status report, SCM Standards, Design Concepts and Principles, Software Design and Software Engineering. The Design Process, Design Principles, Design Concepts, Effective modular design. The Design Model Object-Oriented Design, Design Documentation. Architectural Design – Software Architecture, Data Design, Architectural Styles, Mapping requirements into a Software Architecture, Transform mapping transaction mapping.

Unit 4

Verification and Validation – Software Inspections, Automated Static Analysis, Clean room Software Development. Software Testing Techniques – Software Testing Fundamentals, Test Case Design, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Testing GUI's, Testing Documentation and Help facilities, Software Maintenance enhancing Maintainability during development, Managerial Aspects of software Maintenance, configuration Management, Source Code Metrics.

Unit 5

Software maintenance: Types of Software Maintenance, The Maintenance Process. Software Process and Project Metrics – Measures, Metrics and Indicators, Metrics in the Process and Project Domains, Software Measurement-Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics. CASE-What is CASE, Building Blocks, Integrated CASE Environments, The CASE Repository Future directions in Software Engineering.

Text Book:

Roger S Pressman, 'Software Engineering: a practitioner's approach**',** 5th Ed., McGraw-Hill International Edition, 2001

References:

1. Richard Fairley, 'Software Engineering concepts', Tata McGraw-Hill, 1997.
2. Ian Sommerville, 'Software Engineering', 6th Ed., Addison Wesley, 2007.
3. Roger S Pressman, 'Software Engineering: a practitioner's approach', 6th Ed., Mc Graw Hill International Edition, 2005.
4. Waman S Jawadekar, 'Software Engineering Principles and Practice', Tata McGraw Hill, 2004.

******

CAS 2402 - Artificial Intelligence

(Revised July 2010)

Unit 1

What is AI, History of AI, Intelligent Agents – Agents and environments – Good behavior – The nature of environments – Structure of agents – Problem Solving –Problem solving agents –Example problems – Searching for solutions – Uniformed search strategies – Avoiding repeated states – Searching with partial information.

Unit 2

Informed Search Strategies – Heuristic function – Local search algorithms and optimisation problems – Local search in continuous spaces – Online search agents and unknown environments **–** Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems **–** Adversarial Search – Games – Optimal decisions in games –Alpha – Beta Pruning – imperfect real-

time decision – Games that include an element of chance.

Unit 3

Logical Agents, Reasoning pattern in propositional logic,Effective propositional inference, Agents based on Propositional Logic First Order Logic – syntax and semantics – Using first order logic – Knowledge engineering Inference – Prepositional versus first order logic – Unification and lifting – Forward chaining – Backward chaining –Resolution

Unit 4

Knowledge representation – Ontological Engineering –Categories and objects – Actions – Simulation and events – Mental events and mental objects. Planning: The planning problem – Planning with state space search – Partial order planning Planning graphs – Planning with propositional logic

Unit 5

Learning From Observations – forms of learning – Inductive learning -Learning decision trees – Ensemble learning

Text Book:

Stuart Russell, Peter Norvig, 'Artificial Intelligence – A Modern Approach', 2nd Ed., Pearson Education, 2004.

References:

1. Nils J. Nilsson, 'Artificial Intelligence: A new Synthesis', Elsevier, 2000.
2. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Ed., Tata McGraw Hill, 2009.

****

CAS 2501 - Network and Data Communications

(Revised July 2010)

Unit 1

Introduction: - Uses of Computer Networks, Network Hardware, Network Software, Reference Models, Example Networks, Network Standardization, The **Physical Layer**: The Theoretical Basis For Data Communication, Guided Transmission Media, Wireless Transmission, Communication Satellites, Public Switched Telephone Network, The Mobile Telephone System.

Unit 2

The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocols. **The Medium Access Sub layer:** The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANS, Broadband Wireless, Bluetooth, Data Link Layer Switching.

Unit 3

The Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality Of Service, Internetworking, The Network Layer in the Internet.

Unit 4

The Transport Layer: The Transport Service, Elements of Transport Protocols, A Simple Transport Protocol, The Internet Transport Protocols (TCP & UDP).

Unit 5

The Application Layer: DNS – Domain Name System, Electronic Mail, The World Wide Web, Multimedia. Network Security: Cryptography, Symmetric-Key Algorithms, Public-Key Algorithms, Social Issues.

Text Book:

Andrew S Tanenbaum , Computer Networks, 4th Ed., Pearson Education 2003.

References:

1. Uyless Black, 'Data Networks: concepts theory and practices', PHI, 1988.
2. Douglas E. Comer, 'Internetworking with TCP/IP, Vol I: Principles, protocols and architecture', PHI, 2005
3. William Stallings, Data and Computer Communication, 6th Ed., PHI 2000.
4. Behrouz A Forouzan, 'Data Communications and Networking', 4th Ed., TMH 2008.

*****

CAS 2502 - Simulation and Modelling

Unit 1

Basics of Simulation Modeling – The Nature of Simulation Systems, System – environment – components, Models and Simulation, Discrete event Simulation, Other Types if Simulation – Continuous Simulation. Combined Discrete – Continuous Simulation – Examples, Monte Carlo Simulation, Advantages and Disadvantages of Simulation – Area of application.

Unit 2

Modeling Complex Systems – List processing in Simulation, Simulation language – Simblib.
Simulation Softwares – Comparison of Simulation Packages with Programming Languages, Classification of Simulation Softwares, Desirable Software Features, General features of GPSS, SIMSCRIPT and SIMULA.

Unit 3

Random Number Generation: Properties of Random Numbers – Generation of Random Numbers, Tests for Random Numbers, Random Variate Generation – Inverse Transforms Technique – Exponential and Uniform /distributions.

Unit 4

Statistical Models in Simulation – Review of Terminology and Concepts – Useful Statistical Models – Queuing Models Characteristics of Queuing Systems, Simulation of a Single Server Queue.

Unit 5

Input Modeling: Data Collection – Identifying the Distribution with Data, Verification and Validation of Simulation Models, Model Building.
Output Analysis for a Single System – Stochastic Nature of Output Data, Types of Simulation with respect to Output Analysis for Terminating Simulations.

Texts Books:

1. Averill M.Law & W.David Kelton, 'Simulation Modeling and Analysis', Tata Mc Graw Hill - 3rd Edn. 2003.
2. Jerry Banks, John S.Carson and Barry L.Nelson, 'Discrete-Event System Simulation', Prentice Hall, 2nd Edn. 1995.

References:

1. Narsingh Deo, 'System Simulation with Digital Computer', PHI 1998.
2. G.Gordon, 'System Simulation', 2nd Ed. Prentice Hall. 1999

******

E1 - Number theory

Unit 1

Unique Factorization: Unique Factorization in Z, Infinitely many primes in Z, $\Sigma(1/p)$ Diverges, The growth of $\pi(x)$ Congruence: properties, complete and reduced residue systems, Fermat's theorem. Euler function, The Chinese Remainder Theorem.

Unit 2

Indeterminate equations: Linear and second degree Diophantine equations Congruence in one unknown, congruences of higher degree with prime and composite modulo, Wilson's theorem, Pell's theorem, Sums of two squares, Sums of four squares, The Fermat equation: Exponent 3, Cubic curves with infinitely many Rational points, The equation $y^2 = x^3 + k$

Unit 3

Quadratic Reciprocity: Quadratic residues, Law of Quadratic Reciprocity, The Legendre symbol, The Jacobi symbol, Square roots modulo p, Cubic and biquardatic Reciprocity, Law of biquardatic Reciprocity, The constructability of Regular polygons.

Unit 4

Primality and Factoring: Pseudoprimes, The rho method, Fermat factorization and factor bases, The continued factorization method, The quadratic sieve method.
Elliptic Curves: Basic facts, group properties, Elliptic curve primality test, Elliptic curve factorization.

Unit 5

Applications of Number Theory: Cryptography, Authentication, Signature Schemes, Indistinguishable data transfer, Bit commitment, Zero Knowledge protocol.

Text Books:

1. Kenneth Ireland, 'A Classical introduction to Modern Number Theory'.2nd Ed., Springer 2004.
2. Tom M.Apostol, 'Introduction to Analytic Number Theory', Narosa Publishing House, 1998

References:

1. Ivan Niven & H.S.Zuckerman, 'Introduction to the theory of Numbers'. 3rd Ed., John Wiley & Sons, New York, 1992.
2. Melvyn B. Nathanson, 'Methods in Number Theory', Springer, 2005
3. Neal Koblitz, 'A Course in Number Theory and Cryptography', 2nd Ed. Springer, 2004.
4. Neal Koblitz, 'Algebraic aspects of Cryptography' Springer, 1999.

*****

E 2 - Number Theory and Cryptography

Unit 1
Divisibility: ged, lem, prime numbers, fundamental theorem of arithmetic, perfect numbers, floor and ceiling functions. Congruence: properties, complete and reduced residue systems, Fermat's theorem. Euler function

Unit 2
Indeterminate equations: Linear and second degree Diophantine equations. Congruence in one unknown, Chinese remainder theorem, congruences of higher degree with prime and composite modulo, Wilson's theorem, quadratic residues.

Unit 3
Introduction to cryptography: attacks, services and mechanisms, security attacks, security services. Conventional Encryption – Classical techniques: model, stegnanography, classical encryption technique, Modern techniques: DES, cryptanalysis, block cipher principles and design.

Unit 4
Algorithms: triple DES, IDEA, blowfish. Confidentiality: Placement of encryption function, traffic confidentiality, key distribution, random number generation. Public key encryption – RSA algorithm, key management and exchange, elliptic curve cryptography.

Unit 5
Message Authentication: requirements, functions and codes, hash functions, security of hash functions and MACS. Hash algorithms: MD5 message digest algorithm, secure hash algorithm. Digital signature: authentication protocols, digital signature standard, Authentication Applications: Kerberos

t Books:

1. C.Y.Hsiung, 'Elementary Theory of Numbers',World Scientific, New Delhi, 1992 **(Unit 1 & 2)**
2. W. Stallings, 'Cryptography and Network Security: Principles and Practice', 4th Ed., Pearson Education, 2006 **(Unit 3,4, & 5)**

erences:

1. Tom M. Apostol, 'Introduction to Analytic number theory', Narosa Publishing House, 1998
2. Ivan Niven & H.S.Zuckerman, 'An Introduction to the theory of Numbers', 3rd Ed., John Wiley & Sons, 1992.
3. S.C.Coutinho, 'The Mathematics of ciphers number theory and RSA cryptography', Universities Press (India) Pvt.Ltd., 1999.
4. B.Schnier, 'Applied Cryptography: Protocols, Algorithms & Source Code in C', 2nd Ed., John Wiley & Sons, 1996.
5. Neal Koblitz, 'A Course in Number Theory and Cryptography', 2nd Ed. Springer, 2004.
6. Johannes A Buchmann, 'An Introduction to cryptography', 2nd Ed., Springer 2004.
7. Melvyn B. Nathanson, 'Methods in Number Theory', Springer, 2005

******

E3 - Applied Probability and Statistics

Unit 1: Basic Statistics: Collection, tabulation and presentation of data, measure of central tendency, dispersion, correlation, association and grouping of data.

Unit 2: Probability: Sample space and events, Axioms of Probability, Additive theorem, Independence and Multiplicative theorem, Conditional Probability and Baye's theorem, Random experiments, Discrete and continuous random variables, Distribution function, Mean, Variance and moment generating function.

Probability Distributions: Genesis and basic properties of Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

Unit 3: Sampling Distributions: Population and Samples, Simple random sampling with and without replacement. Sampling distribution of sample mean when variance is known and unknown, Chi-Square-, Student's-t- and F- distributions.

Estimation: Properties of estimates, Methods of estimation – method of maximum likelihood, method of moments and method of least squares. Illustration for each case.

Unit 4: Interval estimation: Confidence interval for the mean of normal distribution when the variance is known and unknown, Two-sample confidence interval for normal population, Confidence interval for the proportions.

Testing of Hypothesis: Simple and composite hypotheses, Type I and Type II errors, power of a test, Tests of hypotheses on single sample, two-sample, proportions, Chi-square test of goodness of fit and independence.

Unit 5: Regression Analysis: Simple linear regression, estimation of parameters in a linear regression model, measuring the adequacy of the regression model, One-way analysis of variance.

Text Books:

3. Hines, W.W, Montgomery, D.C, Goldman, D. M. & Borror, C.M, 'Probability and Statistics in Engineering'. 4/e. 2003, John Wiley & Sons.
4. Walpole, R. E., Myers, R. H., Myers S L & Keying Ye, 'Probability and Statistics for Engineers and Scientists'. 8/e, 2007, Pearson Education

References:

1. Gupta, S C and Kapur, V K, 'Fundamentals of Mathematical Statistics', Sultan Chand and Co.
2. Erwin Miller and John E.Freund, 'Probability and statistics for engineers' Prentice-Hall of India / Pearson , 7th Ed.

****

E4 - Web Commerce Technologies

Unit 1

Electronic Commerce Environment And Opportunities - Background, The Electronic Commerce Environment, Electronic Marketplace Technologies,Modes of Electronic Commerce – Overview , Electronic Data Interchange, Migration to open EDI, Electronic Commerce with WWW/Internet, Commerce Net Advocacy, Web Commerce Going Forward.

Unit 2

Approaches to Safe Electronic Commerce – Overview, Secure Transport Protocols, Secure Transactions, secure Electronic Payment Protocol, Secure Electronic Transaction, Certificates for Authentication , security on Web Serves and Enterprise Networks. Electronics Cash and Electronic payment Schemes- Internet Monetary Payment and Security Requirements, Payments and Purchase Order Process, On-line Electronic Cash.

Unit 3

Internet/Intranet Security Issues and Solutions – The Need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams. MasterCard/Visa Secure Electronic Transaction –

Introduction, Business Requirements, Concepts, Payment Processing.

Unit 4

E-Mail and secure E-mail Technologies for Electronic Commerce -Introduction, The Means of Distribution, A Model for Message Handling, HowDoes E-mail Work, MIME, S/MIME, MOSS, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet References

Unit 5

Introduction to Servlets – Why Servlets, Servlet Basics, Servlet API Basics, Servlet, Running Servlets, Debugging Servlets, Beyond Servlet API Basics.

Text Books:

1. Daniel Minoli & Emma Minoli, 'Web Commerce Technology Handbook', Tata McGraw-Hill, 19
2. Dustin R Callaway, 'Inside Servlets: A Server Side Programming for the Java platform', Pearson Education, 2005

References:

1. Ravi Kalakota & Andrew B. Whinston, 'Frontiers of Electronics Commerce', Addison-Wesley,1999.
2. Larry J. Hughes, Jr., 'Internet Security Techniques', New Riders, 1995.
3. Terry Bernstein et al, 'Internet Security for Business', John Wiley & Sons Inc, 1996.
4. Vijay Ahuja, 'Secure Commerce on the Internet', AP Professional (Academic Press), 1997.

*****

E5 - Object Oriented Design

Unit 1

Introduction: Object Orientation, OO Development, OO Themes, Evidence for usefulness of OO Development, OO Modeling History. Modeling Concepts: Modeling as a design Technique – Modeling, Abstraction, The three models. Class Modeling – Object and Class Concepts, Link and Association Concepts, Generalization and Inheritance, A Sample Class Model, Navigation of Class Models. Advanced Class Modeling – Advanced Objects and Class Concepts, Association Ends, N – ary Associations, Aggregation, Abstract Classes, Multiple Inheritance, Metadata, Reification, Constraints, Derived Data, Packages.

Unit 2

State Modeling – Events, States, Transitions and Conditions, State Diagrams, State Diagram Behavior. Advanced State Modelling – Nested State Diagrams, Nested States, Signal Generalization, Concurrency, A Sample State Model, Relation of Class and State Models. Interation Modeling – Use Case Models, Sequence Models, Activity Models. Advanced Interaction Modeling – Use Case Relationships, Procedural Sequence Models, Special Constructs for activity models. Concepts Summary – Class Model, State Model, Interaction Model, Relationships among the Models.

Unit 3

Analysis and Design: Process Overview – Development stages, Development Life Cycle. System conception – Devising a System Concept, Elaborating a Concept, Preparing a Problem Statement. Domain Analysis – Overview of Analysis, Domain Class Model, Domain State Model, Domain Interaction Model, Iterating the Analysis.

Unit 4

Application Analysis – Application Interaction Model, Application Class Model, Application State Model, Adding Operations. System Design – Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a system into Sub Systems, Identifying Concurrency, Allocation of Subsystems, Management of Data Storage, Handling Global Resources, Choosing a Software Control Strategy, Handling Boundary Conditions, Setting Trade- off Priorities, Common Architectural Style, Architecture of the ATM System.

Unit 5

Class Design – Overview of Class Design, Bridging the Gap, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance, Organizing a Class Design, ATM Example. Process Summary – System

Conception, Analysis, Design. Implementation Modeling – Overview of Implementation, Fine – tuning Classes, Fine – tuning Generalizations, Realizing Associations, Testing.

Text Book:
Michael Blaha & James Rumbaugh, 'Object Oriented Modeling and Design with UML', 2nd Ed., PHI, 2005.

References:
1.Martin Fowler & Kendall Scott, 'UML Distilled: a Brief Guide to the Standard Object Modeling Language', 2nd Ed.,2004.
2. Mark Priestly, 'Practical OOD with UML', 2nd Ed., 2004.
3. Erich Gamma et al, 'Design Patterns: Elements of Reusable Object Oriented Software', Pearson, 2002.

******

E6 - Security in Computing

Unit 1
Introduction: Security problem in computing – Meaning – Kinds of Security breaches – Computer Criminals – methods of defense
Cryptography: Terminology and background- Substitution ciphers- Transpositions- Characteristics of good cipher- Symmetric and asymmetric encryption- Stream and Block Algorithm

Unit 2
Secure encryption systems: DES- AES- Public key encryption- RSA, Merkle Hellman Knapsacks- Uses of Encryption
Secure Programs- Viruses and other malicious code, Controls against Program Threats

Unit 3
Protection Services: Security methods of OS – Memory and address protection- Protection Mechanisms- User Authentication
Design of secure OS: Models of Security, Trusted OS design, Assurance Methods, Implementation examples.

Unit 4
Levels of Security: Database security- Security versus Precision-Proposals for Multilevel security- Network security- Threats in Network security – IDS- Firewalls- security for email

Unit 5
Other issues: risk analysis- Security Planning- Organizational security policies- Physical security- Modeling Cyber Security- Privacy principles and policies- Comparison of Copy right, Patent and Trade secret – Computer Crime- Ethical Issues in Computer Security

Text Book:
Charles P. Pfleeger, Shari Lawrence Pfleeger, 'Security in Computing'. 4th Ed. Prentice Hall, 2007

Refernces:

1. Michael E. Whitman, 'Infrormation Security: incident response and disaster recovery', Cengage Learning, 2009.
2. Wm. Arthur Conklin, Gregory B. White, Chuck Cotheren, Dwayne Williams, Roger Lavis, 'Principles of Computer Security-Security+and Beyond', Dreamtech Press, 2004

******

E7 - Embedded Systems

(July 2010)

Unit 1 : Introduction to embedded systems:

Categories of embedded systems, overview of embedded system architecture, requirements of embedded systems, challenges and issues related to embedded software development, recent trends in embedded systems, applications of embedded systems

Unit 2 : Architecture of embedded systems:

Hardware architecture- processor, memory- RAM, ROM and Hybrid memory, latches and buffers, clock circuitry, watch dog timer and reset circuitry, chip select logic circuit. Input/output devices, SPI and I^2C interfaces, Debug port-IEEE 1149. Power supply unit. Software architecture- Services provided by an operating system, Architecture of embedded operating systems, Categories of embedded operating systems: Non real- time embedded operating systems, Real-time operating systems, Mobile / Handheld operating systems, Application software, Communication software- TCP/IP protocol suite, Process of generating executable image- cross-platform development, boot sequence.Development and testing tools-Hardware development and testing tools, Software development and testing tools

Unit 3 : Programming for embedded systems:

Overview of ANSI C, GNU development tools, Bit manipulation using C-calculation of CRC, Memory management, Timing of programs, Device drivers-tools for device driver development, Productivity tools- makefile, debugger, profiler, indenting, revision control, Code optimization, C coding guidelines, programming in C++, Programming in Java- Java 2 Micro Edition(J2ME), Server side programming, Java development tools

Unit 4 : Communication interface standards:

Need for communication interface, RS232/UART: RS232 communication parameters, RS232 connector configurations, UART, Null Modem cable connection, USB:USB physical interface, features of USB, IEEE 1394: features, protocol architecture, Ethernet: protocol architecture, CSMA/CD protocol, IEEE 802.11: CSMA/CA protocol, Bluetooth: Bluetooth system specifications, Bluetooth protocol architecture, Bluetooth state transition diagram, PCI Bus

Unit 5 : Embedded/Real time operating systems:

Architecture of the Kernel, Tasks and task scheduler- task states, context switching, scheduling algorithms, rate monotonic analysis, task management function calls, Interrupt service routines, Semaphores- semaphore management function calls, Mutex- mutex management function calls, Mailboxes- mailbox management function calls, Message queues- message queue management function calls, Event registers- event register management function calls, Pipes- pipe management function calls, Signals- signal management function calls, Timers- timer management function calls, Memory management, priority inversion problem-priority inheritance. Overview of Embedded/ Real-time operating systems:Embedded operating systems: Embedded NT, Windows XP Embedded, Embedded Linux. Real –time operating systems: QNX Neutrino, VX works, Micro C/OS- II, RT Linux. Handheld OS: Palm OS, Symbian OS

Text Books:

1. Dr. K.V.K.K Prasad: Embedded / Real-time systems: Concepts, design and programming: the ultimate reference, Dreamtech Press, 2009.
2. Dr. K.V.K.K Prasad, Vikas Gupta, Avnish Dass, Ankur Verma, 'Programming for embedded systems: cracking the code', Wiley Publishing, 2003.

References:

1. Frank Vahid, Tony Givargis, 'Embedded system design: A unified hardware/software introduction', Wiley India, 2006.
2. Steve Heath, 'Embedded System design', 2nd Ed., Elsevier, 2009.
3. David .E. Simon, 'An Embedded Software Primer', Pearson Education, 2008.
4. Raj Kamal, 'Embedded Systems: Architecture, programming and design', Tata Mc Graw Hill, 2003.
5. Jochen H. Schiller: Mobile communications, Pearson Education, 2009.

******

E8 - Linux System Programming

(Revised, July 2010)

Unit 1

Linux Evolution, Introduction, and Setup, Main characteristics of Linux OS, Linux Distributions, Basic Linux installation and administration, General kernel responsibilities, Kernel Overview, Kernel modules, Linux versus other Unix like Kernels. Memory Addressing, Memory Addresses, Segmentation in Hardware, Segmentation in Linux, Paging in Hardware, Paging in Linux, Page Frame Management, Swapping, Swap Cache.

Unit 2

Processes, Process structure, Process Table, Viewing processes, System processes, Process scheduling, Scheduling policy, The Scheduling Algorithm, System calls related to scheduling, Starting New processes, Waiting for a process, Zombie process. Signals, The Role of signals, Generating a signal, Delivering a signal, System calls related to Signal Handling.

Unit 3

Interprocess communication, Pipes, FIFOs, Virtual file system, Virtual file system data structure, File system types, File system mounting, File locking, Managing I/O Devices, I/O Architecture, Device Drivers, The Ext 2 and Ext 3 File system. Networking, System calls related to Networking. Sending / Receiving packets from the Network Card.

Unit 4

An Introduction to Device Drivers, Building and Running Modules, Char Drivers, Debugging techniques, Concurrency and Race conditions, Advance Char Driver Operations, Communicating with Hardware, Interrupt Handling.

Unit 5

Embedded Linux, Architecture of Embedded Linux, Embedded Development Environment, GNU cross platform tool chain : GNU toolchain basics ,Kernel Headers Setup , Binutils Setup ,Bootstrap Compiler Setup ,C Library Setup ,Full Compiler Setup, Finalizing the toolchain Setup ,Using the toolchain

Text Books:

1. Daniel P Bovet & Macro Cesati, 'Understanding the Linux Kernel', 3rd Ed., O'Reilly, 2005.
2. Jonathan Corbet &Alessandro Rubini, 'Linux Device Drivers',O'Reilly, 3rd Ed.,2005.
3. Karim Yaghmour, 'Building Embedded Linux Systems', O'Reilly, 2nd Ed.,2008.

References:

1. Robert Love, 'Linux Kernel Development', Novell Press, 2nd Ed., Jan 2005.
2. Michael Beck, Harald Bohme, 'Linux Kernel Internals', Addison-Wesley Professional, 2nd Ed., 1997.
3. Richard Stones, Neil Matthew, 'Beginning Linux Programming', Wrox Publishers, 4th Ed., 2007.
4. Christopher Hallinan, 'Embedded Linux Primer: A Practical Real-World Approach', PHI, 1st Ed., 2006.
5. P. Raghavan, Amol Lad, 'Embedded Linux System Design and Development, 1st Ed., Auerbach, 2005.

******

E9 - Basic Java Programming

(July 2010)

Unit 1

Review of OOPs and Java Basics: Java Programming environment, fundamental programming structures in Java: comments, data types, variables, operators, strings, Input and Output, control flow, Big Numbers, Arrays. Objects Classes and Inheritance, Interfaces: Object cloning, Interfaces and call backs . Inner classes: local, Anonymous and static Inner classes, Basic event handling, Applets.

Unit 2

Swing programming: the model-view-controller design pattern, Introduction to layout management,

Text Input, Choice components, Menus and Dialog Boxes, Exception handling basics.

Unit 3
Streams and Files: Streams, Text Input and Output, Random Access Files, Object Streams and serialization, File Managements.
Threads: Thread states, Thread creation ,Thread properties, Synchronization and User interface Programming.

Unit 4
Collections: collection interfaces, concrete collections: LinkedList, ArrayList, HashSet, TreeSet, PriorityQueue, Maps. The collection frame works, Algorithms, Legacy collections: HashTable class, Enumerations, Property Maps, Stacks and BitSets.
Database Programming: The design of JDBC, The Structured Query Language, JDBC configuration, executing SQL statements, Scrollable and Updatable Result sets, Row sets, Transactions, Advanced Connection management, LDAP.

Unit 5
Distributed Object: The roles of client and server, Remote method calls, The RMI programming model: setting up, parameter passing, server object activation.
Java Beans: creating beans, Using Beans to build an application, Naming patterns for Bean property types, BeanInfo classes, Property editors, Customizers, Java Bean Persistence.

Text Book:
Horstmann & Coronell, 'Core Java', Volume 1 and 2, 8th Ed., Pearson, 2008.

References:
1. James. P. Cohoon, Jack. W. Davison, 'Programming in java 5.0', Tata McGraw Hill, 2006.
2. Thomas Wu, 'An introduction to Object Oriented Programming with Java',Tata McGraw Hill, 2006.
3. Bernard Van Haecke, 'JDBC: Java Database Connectivity', IDG Books India, 2000.

******

E10 - Linux Internals

Unit 1
Introduction and Environmental setup, Main characteristics of Linux OS. Linux Distributions, Kernel Overview. Linux versus other Unix like Kernels. Memory Addressing, Memory Addresses, Segmentation in Hardware, Segmentation in Linux, Paging in Hardware in Linux.

Unit 2
Process, Process structure , Process Table, Viewing processes, system processes, process scheduling, scheduling policy. The scheduling Algorithm, System calls related to scheduling, Starting New processes. Waiting for a process. Zombie process, Signals, The Role of signals, Generating a signal, Delivering a signal, System calls related to Signal Handling.

Unit 3
Interrupts and Exceptions, Role of interrupts signals, initializing the Interrupt Descriptor Table, Exception Handling, Interrupt Handling, Kennel Synchronization, System calls.

Unit 4
Memory Management, Page Frame Management, Linux page Tables, page allocations and Deallocation, Memory Area Management, Memory Mapping, Demand paging, The Linux page cache, Swapping, Swap cache.

Unit 5
Interprocess communication, pipes, FIFOs, Virtual file system, Virtual file system data structure, File system types, File system mounting, File locking, Managing I/O Devices, I/O Architecture, Device

Drivers. The Ext 2 and Ext 3 File system. Networking, System calls related to Networking. Sending/Receiving packets from the Network Card.

Text Book:

Daniel P Bovet & Macro Cesati, 'Understanding the Linux Kernel', O' Reilly, 2nd Ed., 2006.

References:

1. Moshe Bar, 'Linux Internals', TMH, 2000.
2. Michael Beck, Harald Bohme, 'Linux Kernel Internals', Addison-Wesley Professional, 2nd Ed., 1997.
3. Robert Love, 'Linux Kernel Development', Pearson, 1st Ed.
4. Jonathan Corbet, Alessandro Rubini, 'Linux Device Drivers', O'Reilly, 3rd Ed.,2005.
5. Richard Stones, Neil Matthew, 'Beginning Linux Programming', Wrox Publishers, 2007.

******

E11 - Compiler Design

(Revised July 2010)

Unit 1

Introduction to Compilers, The fundamental principles of compilation, Structure of a Compiler, An overview of phases of a Compiler: a front end, an Optimizer, a Back end and Infrastructure, Properties of a Compiler. High level view of translation – Grammars and Languages, Checking Syntax, Checking Meaning, Creating and Maintaining Run Time Environment, Improving code, Creating Output program.

Scanning – Introduction, Recognizing words, Automatic Scanner construction, A formalism for Recognizers – Finite Automata, Regular Expressions. From Regular Expression to Scanner and Back, Regular Expression to NFA, NFA to DFA,DFA to Minimal DFA,DFA to Regular Expression, Two Pass Scanners.

Unit 2

Parsing – Introduction, Context Free Grammars, Backus – Naur Form, Ambiguous Grammar. Context Free Grammar vs Regular Expressions. Classes of Context Free Grammar and their Parsers. Top Down Parsing, Bottom Up Parsing, Building LR(1) Tables. Context Sensitivity Analysis, Data Types – Type Systems, Type Checking , The Attribute Grammar Framework, Ad – hoc System Directed Translation.

Unit 3

Intermediate Representations – Graphical Intermediate Representations – Parse Tree, Abstract Syntax Trees, DAG, Graphs – Control Flow Graph, Dependence Graph. Linear Intermediate Representations – Stack Machine Code, Three Address Code. Auxiliary Data Structures. The procedure abstraction – techniques. Name Spaces, Scopes and Activation Records, Managing Memory.

Unit 4

Code Generation, Assigning storage locations, Arithmetic operator, Boolean and Relational operators, Storing and accessing Arrays. Control Flow Constructs (Structured and Unstructured), Procedure calls.

Machine Independent Optimization – Introduction, Goal of Optimization, Considerations for Optimization, Opportunities for Optimization, Scope of Optimization. Redundant Expressions – DAG,Value Numbering, Value Numbering over regions larger than basic blocks. Global Redundancy elimination.

Unit 5

Machine Dependent Code Optimization, Instruction Selection – a TREE WALK Approach, TREE PATTRERN MATCHING, PEEPHOLE OPTIMIZATION, TREE PATTERN MATCHING ON Quads. Instruction Scheduling – Introduction, List Scheduling, Regional Scheduling. Instruction

Allocation – Introduction, Back ground issues, Local Register allocation and assignment, Global register allocation and assignment.

Text Book: Keith D. Cooper & Linda Torczon, 'Engineering a Compiler'**,** Elsevier, 2004.

References:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D Ullman, 'Compiler: principles ,Techniques and Tools**'**, Addison Wesley, 1986
2. Allen I Holub, 'Compiler Design in C**',** Prentice Hall, 1993
3. Andrew W. Appel, 'Modern Compiler Implementation in C', Revised Ed., Cambridge University Press 2000
4. Y N Srikanth, Priti Shanker, 'Compiler Design Handbook: Optimization and Code Generation' , CRC Press, 2007.

******

E12 - Advanced Java Programming

(Revised July 2010)

Unit 1

Core Java Overview: Object oriented concepts, Exception Handling, Multi Threading Introduction to JDBC : Overview of JDBC API, The Java.sql package, JDBC Drivers, Executing SQL commands using JDBC Drivers, static and dynamic Execution of SQL statements, Execution of Stored Procedures using JDBC. Introduction to Transactions and Transaction Methods. Introduction to JNDI, Introduction to Data Source and Connection pooling, Introduction to Web Applications, Web Servers Overview of J2EE Technologies.

Unit 2

Introduction to Java Servlets, Static and Dynamic contents, Servlet life Cycle and Life cycle methods, Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, ServletConfig and ServletContext, Servlet Redirection and Request Dispatch, Servlet Synchronization and Thread Model. Maintaining Client State: Cookies, URL rewriting, Hidden form fields, Session Tracking. Introduction to JSP : JSP & Servlet as Web Components, Servlets vs. JSP, JSP Lifecycle, JSP Page Lifecycle Phases, General Rules of Syntax, JSP syntactic elements, JSP element syntax, Template content.Introduction to JSP elements, JSP Standard Actions

Unit 3

J2ME Overview: Inside J2ME -How J2ME is organized, J2ME and Wireless Devices

Small Computing Technology: Wireless Technology-Mobile Radio Networks, Messaging, PDAs, Mobile Power, set Top Boxes, smart cards.J2ME Architecture and Development Environments: J2ME Architecture, Small computing Device Requirements, MIDlet programming, J2ME Software Development Kits, Helloworld J2ME Style, J2ME Wireless Toolkit.

Unit 4

J2ME User Interfaces :Commands, Items and Event Processing,-Display class, Command Class, Item Class, Exception handling.Overview of High-Level Display: Screens: Alert Class, Form Class, Item Class, List Class, Text Box Class.Overview of Low-Level Display: Canvas: The Canvas, User Interactions, Graphics.

Unit 5

Record Management System: Record Storage, Writing and Reading Records, Sorting and Searching Records.J2ME Database Concepts: Database Schema, Foreign keys, The Art of Indexing-Drawbacks of Using an Index, Clustered Keys, Derived Keys, Selective Rows.JDBC and Embedded SQL-Introduction: tables, Indexing, Inserting Data into Tables-Insert a Row, Selecting Data from a Table-Select All data ,Request One column and multiple columns, Request Rows ,Request Rows and Columns. Metadata, Updating and Deleting Data from a table. Views: Rules for using Views Create a view, Group and Sort Views:Personal Information Manager: PIM Databases, The Contact databases, The Event databases, Error Handling.

Text Books:

1. Subrahmanyam Allamaraju and Cedric Buest, 'Professional Java Server Programming: J2EE 1.3 Edition, Apress publication, 2007.

2. James Keogh, 'J2ME: The Complete Reference', Tata McGraw-Hill, 2007.

References:

1. Dustin R Callaway, 'Inside Servlets: A Server Side Programming for the Java platform', Pearson Education, 2005.
2. Vivek Chopra, Jon Eaves, Rubert jones, Sing Li, John T.Bell, 'Beginning JavaServer Pages', Wrox publishers, 2005.
3. 'Beginning J2EE 1.4' With foreword by Ivor Horton, Kevin Mukhar and James L.Weaver, Apress, 2004.

******

E13 - Advanced Java Mobile Programming

(July 2010)

Unit 1

Core Java Overview: Object oriented concepts, Exception Handling, Multi Threading Introduction to JDBC : Overview of JDBC API, The Java.sql package, JDBC Drivers, Executing SQL commands using JDBC Drivers, static and dynamic Execution of SQL statements, Execution of Stored Procedures using JDBC. Introduction to Transactions and Transaction Methods.

Unit 2

J2ME Overview: Inside J2ME -How J2ME is organized, J2ME and Wireless Devices

Small Computing Technology: Wireless Technology-Mobile Radio Networks, Messaging, PDAs, Mobile Power, set Top Boxes, smart cards.

J2ME Architecture and Development Environments: J2ME Architecture, Small computing Device Requirements, MIDlet programming, J2ME Software Development Kits, Helloworld J2ME Style, J2ME Wireless Toolkit.

Unit 3

J2ME Best Practices and Patterns, Commands, Items and Event Processing: J2ME User Interfaces-Display class, Command Class, Item Class, Exception handling.

High-Level Display: Screens: Alert Class, Form Class, Item Class, List Class, Text Box Class.Low-Level Display: Canvas: The Canvas, User Interactions, Graphics

Unit 4

Record Management System: Record Storage, Writing and Reading Records, Sorting and Searching Records.J2ME Database Concepts: Database Schema, Foreign keys, The Art of Indexing-Drawbacks of Using an Index, Clustered Keys, Derived Keys, Selective Rows, Exact matches and Partial Matches.JDBC and Embedded SQL; tables, Indexing, Inserting Data into Tables-Insert a Row, Selecting Data from a Table-Select All data ,Request One column and multiple columns, Request Rows ,Request Rows and Columns. Metadata, Updating and Deleting Data from a table. Views: Rules for using Views Create a view, Group and Sort Views:

Unit 5

Personal Information Manager: PIM Databases, The Contact databases, The Event databases, Error Handling.Introduction to Web services: Basics, J2EE Multitier Web Services Architecture, Inside WSDL, J2ME MIDlets and Web services, RMI Concept, SOAP Basics, WSDL and SOAP.

Text Books:

1. James Keogh, 'J2ME: The Complete Reference', Tata McGraw-Hill, 2007
2. Subrahmanyam Allamaraju and Cedric Buest, 'Professional Java Server Programming: J2EE 1.3 Edition, Apress publication, 2007.

References:

1. Sing Li, 'Beginning J2ME: From Novice to Professional', 3rd Ed., Apress Publication, 2005.
2. Kim Topley, 'J2ME in a Nutshell', O'reilly, 2005.
3. Cay S.Horstmann.Gary Cornell, 'Core Java: Volume II. Advanced Features', Prentice Hall, 8th Ed., 2006

******

E14 - Web Enabled Java Programming

(July 2010)

Unit 1

Core Java Overview: Object oriented concepts, Exception Handling, Multi Threading Introduction to JDBC : Overview of JDBC API, The Java.sql package, JDBC Drivers, Executing SQL commands using JDBC Drivers, static and dynamic Execution of SQL statements, Execution of Stored Procedures using JDBC. Introduction to Transactions and Transaction Methods. Introduction to JNDI, Introduction to Data Source and Connection pooling, Introduction to Web Applications, Web Servers Overview of J2EE Technologies.

Unit 2

Introduction to Java Servlets, Static and Dynamic contents, Servlet life Cycle and Life cycle methods, Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, ServletConfig and ServletContext, Servlet Redirection and Request Dispatch, Servlet Synchronization and Thread Model. Maintaining Client State: Cookies, URL rewriting, Hidden form fields, Session Tracking.

Unit 3

Introduction to JSP : JSP & Servlet as Web Components, Servlets vs. JSP, JSP Lifecycle, JSP Page Lifecycle Phases, General Rules of Syntax, JSP syntactic elements, JSP element syntax, Template content.JSP elements-directives,declarations,expressions,scriptlets,actions.JSP Standard Actions: jsp:useBean, jsp:getPreoperty, jsp:setProperty, jsp:include, jsp:forward, jsp:plugin,jsp:param,java Server Pages Standard Tag Library(JSTL).

Unit 4

Introduction to JSF Frameworks: Getting started:A Simple Example, Sample Application Analysis, Development Environments for JSF.Managed Beans:A Sample Application,Bean Scopes Configuring Beans, Navigation, Static Navigation ,Dynamic Navigation,Standard JSF tags,Data tables,conversion and validation Overview of the Conversion and Validation Process ,Using Standard Converters.Event Handling: Life Cycle Events, Value Change Events, Action Events , Event Listener Tags,Immediate Components, Passing Data from the UI to the Server ,.Custom Components, Converters and Validators: Classes for Implementing Custom Components, Tags and Components,The Custom Component Developer's Toolbox, Encoding: Generating Markup, Decoding: Processing Request Values ,Using Converters, Implementing Custom Component Tags, The TLD File, The Tag Handler Class, Defining Tag Handlers in JSF 1.1 .

Unit 5

AJAX :Ajax Fundamentals ,JavaScript Libraries, The Prototype Library ,The Fade Anything Technique Library ,Form Completion. Realtime Validation,Propagating Client-Side View State Direct Web Remoting,Ajax Components,Hybrid Components,Keeping JavaScript Out of Renderers,Transmitting JSP Tag Attributes to JavaScript Code,Ajax4jsf,Implementing Form Completion with Ajax4jsf,Implementing Realtime Validation with Ajax4jsf.Introduction to Java Web Services, Future Trends in Web Technology WEB 2.0 and Beyond- Flex.

Text Books:

3. Subrahmanyam Allamaraju and Cedric Buest, 'Professional Java Server Programming: J2EE 1.3 Edition, Apress publication, 2007.
4. David Geary,Cay Horstmann, 'Core Java Server Faces' 2nd Ed., Prentice Hall-2007

References:

1. Dustin R Callaway, 'Inside Servlets: A Server Side Programming for the Java platform', Pearson Education, 2005.
2. Vivek Chopra, Jon Eaves, Rubert jones, Sing Li, John T.Bell, 'Beginning Java Server Pages', Wrox publishers, 2005.
3. 'Beginning J2EE 1.4' With foreword by Ivor Horton, Kevin Mukhar and James L.Weaver, Apress, 2004.
4. Simon Brown, Sam Dalton, Daniel Jepp, David Johnson, Sing Li, and Matt Raible, , Ed. 'Pro JSP 2', Edited by Kevin Mukhar . 4th Ed. Apress Publication, 2005.
5. Kito D. Mann, 'JavaServer Faces in Action', Dreamtech Press, 2005.
6. Jonas Jacobi and John R. Fallows, 'Pro JSF and Ajax: Building Rich Internet, Components', Apresss Publications, 2006.
7. Tariq Ahmed, Jon Hirshi, Faisal Abid, 'Flex 3 in Action', Dreamtech Press, 2009.

E15 - Data Mining

(July 2008)

Prerequisite: **E3 - Applied Probability and Statistics**

Unit 1

An overview of data mining: Data Mining: applications, Knowledge discovery, Challenges, Data mining tasks, Examples.

Data: Different types of data, Quality of data, Data preprocessing methods. Measures of similarity and dissimilarity of data.

Unit 2

The Iris data sets, Summary statistics, **Visualization**: Motivations, General concepts, Techniques of visualization, Visualizing higher dimensional data, Overview of OLAP and multidimensional data analysis.

Unit 3

Basic concepts of classification: Definition, Descriptive and Predictive modeling, General approach to solving a classification problem, Decision Trees, Model overfitting Evaluating the performance of a classifier, Methods for Comparing classifiers.

Alternative Techniques Of Classification: Rule based classifier, Nearest neighbor classifiers, Baysiean classifiers, Artificial neural networks.

Unit 4

Association analysis: Basic concepts: Problem Definition ,Frequent Item set generation, Rule generation, compact item sets, Alternative methods for generating frequent item sets. Evaluation of association patterns.

Unit 5

Cluster analysis: Basic concepts And algorithms: K means, Agglomerative hierarchical clustering, DBSCAN, Cluster evaluation .

Basics Of anomaly detection: Preliminaries, Statistical approaches.

Text Book:

Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 'Introduction to Data Mining', Pearson, 2006 .

References:

1 Ian H. Witten, Eibe Frank, 'Data Mining: Practical Machine Learning Tools and Techniques', 2nd Ed., Morgan Kaufmann, 2005.

2 Arun K. Pujari, 'Data Mining Techniques', Universities Press, 2006.

******

E16 - Software Project Management

Unit 1

Introduction to Management – Management: Science, Theory and Practice – Definition of Management: It's nature and purpose, The aim of all managers Science or Art? The Systems approach to Operational Management, The functions of Managers. Software Engineering Project Management: Major issues of Software Engineering, Functions and activities of Management, planning, organizing, staffing, directing and controlling a software Engineering Project.

Unit 2

Project Evaluation: Strategic Assessment, technical Assessment, Cost-benefit analysis, cash

flow forecasting, cost-benefit evaluation techniques, Risk evaluation.

Selection of an appropriate project approach: Choosing Technologies, technical plan contents list, choice of process models, structure versus speed of delivery, The Waterfall model, The V-process model, the spiral model, Software prototyping, other ways of categorizing software prototypes. Controlling changes during prototyping, incremental delivery, dynamic systems development method, Extreme programming Managing iterative processes, selecting the most appropriate process model.

Unit 3

Software Effort Estimation: Problems with over and under estimates, The basis for Software estimating, Software effort estimation techniques, expert judgment, estimating by analogy, Albrecht function point analysis, function points Mark II, Object points, a procedural code –oriented approach, COCOMO: A parametric model.

Unit 4

Activity planning: The objectives of activity planning, When to plan, Project Schedules, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, The forward pass, The backward pass, Identifying the critical path, Activity float, Shortening the project duration, Identifying critical activities, Activity-on-arrow networks. Risk Management: The nature of risk, types of risks, Managing Risk, Hazard Identification, Hazard Analysis, Risk planning and control, Evaluating risks to the schedule.

Unit 5

Monitoring and control: Creating the framework, Collecting the data, Visualizing progress, Cost monitoring, Earned value, prioritizing monitoring, Getting the project back to target, change control Managing Contracts: Types of contracts, Stages in contract placement, Typical terms of a contract, Contract Management, acceptance. Managing people and organizing teams: Understanding behavior, Organizational behavior: a background, Selecting the right person for the job, instruction in the best methods, Motivation, The Oldham-Hackman job characteristics Model, Working in groups, Becoming a team, Decision making, Leadership, Organizational structures, Stress, Health and Safety.

References:

1. Bob Hughes & Mike Cotterell, 'Software Project Management', Tata McGraw-Hill, 2004.
2. 'Software Engineering Project Management', Edited by Richard H Thayer, Wiley-IEEE, Computer Society Press, 2004.
3. Walker Royce, 'Software Project Management: A unified framework', Pearson Education, 2003.
4. Roger S Pressman, 'Software Engineering: a Practitioner's approach', 6th Ed., Tata McGraw-Hill, 2004.
5. Donald J Reifer, 'Software Management', 6th Ed., Wiley-IEEE Computer Society Press, 2002.

******

E17 - Cryptography and Network Security

Unit 1

Foundations of Cryptography and Security – Ciphers and Secret Messages, Security Attacks and Services, Mathematical Tools for Cryptography, Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms, Conventional Symmetric Encryption Algorithms, Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Strength of DES.

Unit 2

Modern Symmetric Encryption Algorithms, IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution, Stream Ciphers and Pseudo Random Numbers, Pseudo Random Sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad.

Unit 3

Public Key Cryptography – Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Excahnge Algorithms, Public-Key Cryptography Standards

Unit 4

Hashes and Message Digests – Message Authentication, MD5, SHA, RIPEMD, HMAC, Digital Signatures, Certificates, User Authentication, Digital Signature Standard, Security Handshake Pitfalls, Elliptic Curve Cryptosystems.

Unit 5

Authentication of Systems, Kerberos, Electronic Mail Security, Pretty Good Privacy, IP and Web Security, Secure Sockets and Transport Layer, Electronic Commerce Security, Electronic Payment Systems, Secure Electronic Transaction, Digital Watermarking.

Text Book:

Behrouz A Forouzan, 'Cryptography and Network Security', Tata Mc Graw Hill, 2005.

References:

William Stallings, 'Cryptography and Network Security: Principles and Practices', 4th Ed., Pearson Education, 2005.

******

E18 - Intelligent Systems

Unit 1

Basic concepts of Neural Network – Network properties – Learning in simple neurons – single layer perceptrons – multi layer perceptrons

Unit 2

Supervised and unsupervised learning – Back propagation – derivation – Kohonen self organizing Networks – algorithms –learning vector quantization.

Unit 3

Recurrent Networks – Hopefield networks – Boltzmann machines – Adaptive resonance theory- architecture and operations- algorithm- Associative memories.

Unit 4

Fuzzy sets- Introduction- crispsets- Notion of fuzzy set- Basic concepts of fuzzy sets- classical logic (overview) - fuzzy logic.

Unit 5

Operations on fuzzy sets- fuzzy complement – union- intersection- combination of operations – fuzzy relations – equivalence and similarity relations- fuzzy relational equations-applications.

Text Books:

1. Limin Fu, 'Neural networks in computer intelligence', McGraw Hill Inc, 1994.
2. Didier Dubois & Henri Prade, 'Fuzzy sets and systems: theory and applications', Academic Press, 1980.

References:

1. Wasserman P.D, 'Neural computing: theory and practice', Van Nostrand Reinhold, New York, 1989.
2. George J.Klir & Tina A.Folger, 'Fuzzy sets, uncertainty and information', Prentice Hall, 1988.

****

E19 - Visual Programming VB.net

Unit 1
The Microsoft .NET Framework – Introduction, Common Language Runtime, .NET Complaint Programming Languages, Creating Assemblies, Understanding Metadata, Using System Services, Microsoft Intermediate Language, Using Namespace, The Common Type System, Relying On Automatic Resource Management, Introduction to Visual Studio .NET & VB.NET Programming Fundamentals – Variables & Types, Program Flow Control, Working with Data Structures, String Handling, Error Handling.

Unit 2
Object Oriented Programming – Classes, Constructors, Inheritance & Interfaces, Applying Object & Components – Abstraction, Encapsulation, Polymorphism, Advanced Programming – Windows Forms – Forms as Classes, Forms at Design Time, Forms at Runtime Controls, Creating Windows Controls – Source of Controls, Developing Custom Controls in .NET, Inheriting from an Existing Control, The Control & UserControl Base Classes, Composite UserControl, Windows Services – Characteristics, interacting with Windows Services, Creating a Windows Service.

Unit 3
Database: Data Access with ADO.NET, ADO.NET components, .NET Data Providers, The DataSet Component, Data Binding – Presenting Data, Master / Details, Data Binding, Forms , Using XML in VB.NET – Introduction to XML, XML Serialization, System XML Document Support, XML Stream Style Parsers.

Unit 4
Working with Classing COM & Interfaces – COM, COM & .NET, Active X Controls, Using .NET Components in COM World, Threading – Processes, AppDomains, and Threads, Thread Scheduling, Thread Safety & Thread Affinity, Remoting – Basic Terminology, SingleCall, Singleton & Activated Objects, Security in the .NET Framework – Concepts, Permissions, Application Deployment.

Unit 5
Developing Web Applications – Anatomy, Controls Available, Events in Web Forms, Web Forms Versus ASP, Creating Web Controls – Types of Custom Web Controls, Creatint a Web User Control, Creating a Subclassed Control, Introduction to Web Services.

Text Book:
Bill Evjen, Billy Hollis, Rockford Lhotka, Tim Mc Carthy, 'Professional VB.NET 2003', 2004 Edition, Wiley Publishing.

References:

1. Carneron Wakefield, Henk-Evert Sonder, Wei Meng Lee, 'VB.NET Programming Developer's

Guide', IDG Books, 2001.
2. Steven Holzner, 'Visual Basic .NET Programming Black Book', Dreamtech Press 2006.

******

E20 - Digital Image Processing

(July 2008**)**

Unit 1

Introduction: What is digital image processing Origins, application areas, Fundamental steps in digital image processing, components of an image processing system.

Digital Image Fundamentals: elements of visual perception, light and electromagnetic spectrum, image sensing and acquisition, image sampling and quantization, some basic relationship between pixels.

Intensity Transformations: Basics of intensity transformations, some basic intensity transformation functions, histogram processing.

Unit 2

Spatial Filtering: fundamentals of spatial filtering, smoothing and sharpening filters.

Frequency domain Filtering: Background, preliminary concepts, sampling, Fourier transforms and DFT, 2-D DFT and properties, frequency domain filtering, low pass filters, high pass filters, implementation.

Unit 3

Image restoration and Reconstruction: Noise models, restoration in the presence of noise, linear-positive invariant degradations, inverse filtering, Wiener filtering, constrained least square filtering, geometric mean filter.

Color Image Processing: color fundamentals, color models, pseudo color and full color image processing, color transformations, smoothing and sharpening, noise in color images.

Unit 4

Image Compression: fundamentals, basic compression methods, digital image watermarking, color image compression.

Morphological Image Processing: preliminaries, erosion and dilation, opening and closing, some basic morphological algorithms, gray-scale morphology.

Unit 5

Image Segmentation: fundamentals, point, line and edge detection, thresholding, region based segmentation, use of motion in segmentation.

Text Book:

Rafael C Gonzalez & Richard E. Woods, ' Digital Image Processing', 3rd Ed., PHI, 2008.

References:

1. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall, 2008.
2. William K. Pratt, 'Digital Image Processing', John Wiley & Sons, 3rd Ed., 2001.

******

E 21 - Software Quality

Pre-requisite: CAS 2401 - Software Engineering

Unit 1

Software Quality in Business Context : The meaning of Quality, The quality challenge, Why is Quality importan Quality control vs. Quality Assurance at each phase of SLDC, Quality Assurance in Software Support projects, Th SQA function (Nina. S. Godbole). Software Quality Assurance: + Quality Concepts – Quality, Quality contro Quality Assurance, Cost of Quality. Software Quality Assurance Background issues, SQA Activities, Softwa Reviews – Cost impact of Software Defects, Defect Amplification and removal. Formal Technical reviews- Th review meeting, Review reporting abd Record keeping, Review guidelines, Sample-driven reviews. Forma Approaches to SQA, Software Reliability – Measures of Reliability and Availability, Software Safety. The SQ plan. (Pressman).

Unit 2

Product Quality and process Quality: Introduction, Software Systems evolution, Product Quality, Models fo product Quality, Process Quality, Software Measurement and Metrics: Introduction, Measurement during Softwa Life cycle Context, Defect Metrics, Metrics for Software Maintenance, Classification of Software Metric Requirements related metrics, Measurements and Process Improvement, Measurement principles, Identifyin appropriate Measures and Metrics for Projects, Metrics implementation in projects, Earned Value Analysis, Issue in Software Measurements and Metrics program implementation, Object- Oriented Metrics: An Overvie (Godbole)

Unit 3

ISO 9001: What is ISO 9000, How does ISO carry out its work, ISO Standards Development Process. How doe the ISO 9000 family of standards work, ISO 9001:2000, ISO Certification Surveillance Audits/RE-certification/Re Assessment Audits. Six Sigma- Introduction, What is six sigma in statistical context, How does six sigma work.

Unit 4

Software CMM and other process improvement models: CMM for software- an overview. Practices followed a mature organizations, Types of CMMs, CMM-Integrated model – What is CMM-I, Background to the CMN MODEL, Types of CMM-I models, Other models for Software Process Improvement and excellence – ISO 1220 IEEE 1074, Malcom Baldrige National Quality Award, The EFQM Excellence Model, People – CMM.

Unit 5

Software Testing – Overview,Purpose of Testing, Differences between Inspection and Testing, Testing v Debugging, Testing Life Cycle, Test Artifacts, The Test Plan, The V-Model for testing Phases, Testing Technique – Equivalence partitioning, Boundary value Analysis, State Transition Analysis , GUI Testing, Performanc Testing, Reliability Testing, Risk-based testing. Gray Box Testing, Extreme testing, Test process improveme framework

Text Book: Nina S Godbole, 'Software Quality Assurance: principles and practice', Narosa Publishing Hous 2004.

References :

1 Roger S. Pressman, 'Software Engineering: a practitioner's approach', 6th Ed., McGraw-Hill International Edition, 2005.

2 Alka Jarvis and Vern Crandall, 'In roads to software quality: how to guide and toolkit', Prentice-Hall PTR, 1997.

3 Pankaj Jalote, 'Software Engineering principles', Narosa Publishing House, 2000.

4 Richard Fairley, 'Software Engineering concepts', Tata McGraw-Hill, 2001.

5 'Software Engineering Project Management', Edited by Richard H Thayer,Wiley-IEEE, Computer Societ Press, 2004.

******