PONDICHERRY UNIVERSITY

MASTER OF COMPUTER APPLICATIONS (MCA)

(For CBCS system in Pondicherry University)

(Effective from the academic year 2009 – 2010)

Eligibility for Admission

Candidates who have secured 55% of marks or above in any one of the following or equivalent, are eligible to apply :

(i) Bachelor's Degree in Computer Applications / Commerce / Corporate Secretaryship / Economics / Business Administration (with Mathematics / Business Mathematics / Statistics / Computer Applications as one of the subjects)

OR

(ii) Bachelor's Degree in Science with Mathematics / Statistics as one of the subjects.

Duration of the Course

The course shall be of three years duration spread over six semesters. The Maximum duration to complete the course shall be 6 years.

Medium

The medium of instruction shall be English.

Passing & Classification

The minimum marks for passing and classification for the award of the MCA Degree shall be as per the existing norms of other PG degree courses of Pondicherry University offered in affiliated colleges.

PONDICHERRY UNIVERSITY

MASTER OF COMPUTER APPLICATIONS (MCA)

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MCA CURRICULUM

Note: All Course Codes are to be preceded with 'COMS'.

I Semester

Sl.No.	Code	Course Title	H/S	Credits
1	301	Mathematical Foundation of Computer Science	H	3
2	302	Computer Organisation and assembly language programming	H	4
3	303	Data Structures	H	3
4	304	Problem Solving and Programming	H	3
5	305	Information Technology	H	3
6	308	Computer Lab I (DS using C)	H	2
7	309	Computer Lab II (Assembly language programming)	H	2

II Semester

Sl.No.	Code	Course Title	H/S	Credits
1	351	Fundamentals of Algorithms	H	3
2	352	Object-Oriented Programming	H	3
3	353	Operating systems	H	3
4	358	Computer Lab III (OOPS Lab)	H	2
5	359	Computer Lab IV (Operating systems)	H	2
6		Elective I	S	3
7		Elective II	S	3

III Semester

Sl.No.	Code	Course Title	H/S	Credits
1	401	Database Management Systems	H	3
2	402	Computer Networks	H	3
3	403	Windows and Visual Programming	H	3
4	408	Computer Lab V (DBMS)	H	2
5	409	Computer Lab VI (Visual Programming)	H	2
6		Elective III	S	3
7		Elective IV	S	3

IV Semester

Sl.No.	Code	Course Title	H/S	Credits
1	451	Internet programming and Web Technology	H	3
2	452	Automata Theory and Compiler Design	H	3
3	453	Software Engineering	H	3
4	458	Computer Lab VII (Web Technology)	H	2
5	459	Computer Lab VIII (CASE Tools)	H	2
6		Elective V	S	3
7		Elective VI	S	3

V Semester

Sl.No.	Code	Course Title	H/S	Credits
1	501	Computer Graphics	H	3
2	502	Management Concepts and Strategies	H	3
3	508	Computer Lab IX (Graphics Lab/Animation 3D 2D)	H	2
4	509	Mini Project	H	3
5		Elective VII	S	3
6		Elective VIII	S	3
7		Elective IX	S	3

VI Semester

Sl.No.	Code	Course Title	H/S	Credits
1	561	Project Seminar	H	4
2	562	Project work	H	4
3	563	Project Report And Viva-voce	H	4

LIST OF ELECTIVES:

Note: All Course Codes are to be preceded with 'COMS'.

Code	Course Title	H/S	Credits
221	Foreign Language - Japanese I	S	3
222	Foreign Language - Japanese II	S	3
223	Foreign Language - French I	S	3
224	Foreign Language – French II	S	3
225	Communication Skills	S	3
226	Accounting and Financial Management	S	3
520	Business Process	S	3
521	Introduction to Programming	S	3
522	Introduction to PC and its utilities	S	3
523	System Software	S	3
524	Operation Research	S	3
525	TCP/IP	S	3
526	Architecture of Unix	S	3
527	Principles of Programming Languages	S	3
528	Middleware Technology	S	3
529	Image Processing	S	3
530	Multimedia Systems and Applications	S	3
531	E-Commerce	S	3
532	Neural Networks	S	3
533	.NET Framework and C#	S	3
534	Client Server Systems	S	3
535	Crypt Analysis and Security Principles	S	3
536	ATM networks	S	3
537	Component software	S	3
538	Distributed database systems	S	3
539	AI and Expert systems	S	3
540	Artificial Intelligence	S	3
541	Fundamentals of Agent technology	S	3
542	Enterprise Resource Planning	S	3
543	Elements of software project management	S	3
544	Software Testing and Quality Assurance	S	3
545	Object Oriented Analysis and Design	S	3
546	Data Warehousing and Mining	S	3
547	Introduction to Bioinformatics	S	3
548	Introduction to Software Architecture	S	3
549	Advanced JAVA	S	3
550	Natural Language Processing	S	3
551	Microprocessor Architecture	S	3
552	Decision Support System	S	3
553	Soft Computing	S	3
554	Principles of Distributed System	S	3

COMS 301: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

UNIT I

Mathematical Logic : Connectives – Negation, Conjunction, disjunction, Statement Formulas and TT, Conditional and Biconditional, Well formed formulas, tautologies, Equivalence of statement formulae, Duality law, Tautological implications, Functionally complete set of connectives; Normal Forms – Disjunctive, Conjunctive, Principal disjunctive and principal conjunctive normal forms.

UNIT II

The theory of inference for statement calculus, Validity using TT, rules of inference, consistency of premises and indirect method of proof, Automatic Theorem proving- Predicate Calculus, Predicates, the statement function, variables and quantifiers.

UNIT III

Set Theory : Basic Concepts of Set theory, Notation, Inclusion and equality , Power set, Operations on sets, Set identities, Ordered pairs and n-tuples, Cartesian products - Relations and Ordering , Relations, Properties of binary relation- relation matrix and graph of a relation, partition and covering of a set, equivalence relations, composition of binary relations, partial ordering, partially ordered set - Functions, Definition, composition, Inverse, Binary and n-ary operations, characteristic function of a set, hashing function- Recursions, Functions, sets and predicates.

UNIT IV

Lattices and Boolean Algebra : Lattices as partially ordered sets, properties of lattices, Lattices as Algebraic systems, Some special lattices - Boolean algebra, functions, representation and minimization.

UNIT V

Graph theory : Definition, Examples, Paths and Cycles, Planarity, colouring graphs

TEXT BOOKS

1. J.P. Tremblay and R.Manohar, *Discrete Mathematical structures with applications to Computer Science*, Tata – McGraw Hill publishers, 2008.
2. Robin. J.Wilson, *Introduction to Graph theory*. (Fourth edition)

COMS 302: COMPUTER ORGANISATION AND ASSEMBLY LANGUAGE PROGRAMMING

UNIT I

Digital logic fundamentals: Number systems – Boolean algebra – gates – simplification of Boolean expressions – **combinational logic** : adders – subtractors – Decoders – encoders – multiplexer / demultiplexers **Sequential Logic** : Flip-flops - Counters.

UNIT II

Introduction to Intel's 8086/88 : Register model – Bus interface Unit – Execution unit – Control Unit: hardwired and microprogrammed control. **Memory organization**: Basic memory cell – RAM, ROM and DRAM – associative, cache and virtual memory organizations.

UNIT III

Assembly Language Programming : Instruction formats – addressing modes – Intel 8086/88 instruction mnemonics – timing – data transfer – arithmetic and machine control instructions - Introduction to Macro assembler.

UNIT IV

Input/Output organization : Input interface **Data transfer techniques** : synchronous – asynchronous – Interrupt driven – Intel 8086/88 interrupt organization – types – DMA – I/O processors – serial communication.

UNIT V

Processor organization: General register organization – stack organization. **IBM PC architecture**: Mother board – display adapters – add on cards – power supply.– Architectural overview of Pentium, P-II, P-III and P-4.

TEXT BOOKS

1. M.Morris Mano, *Computer Systems Architecture*, Pearson Education, 3rd Edition, 2003.
2. Liu Gibson, *Microcomputer Systems the 8086/88 family*, PHI, 2nd edition, 2001.
3. Govindarajulu, *IBM PC and Clones*, PHI, 2002.

REFERENCES

1. A.K.Ray, K.M.Bhurchandi, *Advanced Microprocessors and Peripherals*, TMH, 2000.
2. Peter Abel, *IBM PC Assembly language and Programming*, PHI,2000,

COMS 303: DATA STRUCTURES

UNIT I

Introduction, algorithmic notation, Space and Time analysis of an algorithm, information and its storage representation, Representation and its manipulation of strings, Pattern Matching. Searching and sorting techniques.

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UNIT II

Arrays: Array representation, Array processing – single and multi dimension arrays

Stacks: Stack Representations , stack operations

Queues: Definitions, Implementations of Queues, Circular queues, Application of Queues.

Linked lists: Singly, Doubly, Circular linked list

UNIT III

Trees: nary Trees, Binary Search Trees, Building a Binary Search Tree, Tree Traversal techniques.

Graphs: Definitions, Undirected and Directed Graphs, Traversal, Minimum cost spanning tree, topological sorting.

UNIT IV

Hash Table: Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT V

File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

TEXT BOOKS

1. Ellis Horowitz , Sartaj Sahni and Susan Anderson, *Fundamentals of Data Structures using C*, Computer Science Press, 1993.

2. Jean Paul Tremblay and Paul G. Sorenson, "*An Introduction to data structures with applications*" 2nd edition, Tata McGraw-Hill, 2001

REFERENCE

1. D. Samanta, "*Classic Data structures*", Prentice-Hall of India private ltd., 2001.

COMS 304: PROBLEM SOLVING AND PROGRAMMING

UNIT 1

Introduction to Problem Solving: Problem solving strategies, Problem identification, Problem understanding, Algorithm development, Solution planning (flowcharts, pseudo-code, etc.), Modular programming design. Basic program structure in C, Simple data types, variables, constants, operators, comments, Control Flow; if, while, for, do-while, switch.

UNIT II

Functions: Types, parameters, prototypes, recursion.

Arrays & Pointers: Array usage, Pointers, addresses and types, call by reference, Pointer - array duality, Strings , Arrays of pointers, Arguments to main, Pointers to functions.

UNIT III

Structures: Member accessing, pointers to structures, Structures and functions, Arrays of structures, linked lists, trees.

Other Data Types: Unions, enumerations and bit fields.

UNIT IV

Bitwise Operators: Usage, device accessing.

Type manipulation: Coercion, typedef, initialisation, Static, global, external, register.

Dynamic Allocation: Uses, pitfalls.

The Pre-processor: Define, include, macro's, ifdef.

UNIT V

Input and Output: Concepts, Character and File I/O, Basic Curses, Simple File I/O, The Standard I/O Routines, ANSI Standard Libraries.

TEXT BOOKS

1. Brian W.Kernighan and Dennis M.Ritchie, *"The C Programming Language"*, Pearson Education Inc., 2nd Edition (2005).
2. Byron Gottfried, *"Programming with C"*, 2nd Edition, (Indian Adapted Edition), TMH publications, (2006).
3. Dromey, "How To Solve It By Computer", Dorling Kindersley (India) Pvt Ltd, 2008.

REFERENCES

1. Stephen G.Kochan, *"Programming in C"*, Third Edition, Pearson Education India, (2005).
2. E.Balagurusamy, *"Computing fundamentals and C Programming"*, Tata McGraw-Hill Publishing Company Limited, (2008).
3. Behrouz A.Forouzan and Richard.F.Gilberg, *"A Structured Programming Approach Using C"*, II Edition, Brooks-Cole Thomson Learning Publications, (2007).

COMS 305: INFORMATION TECHNOLOGY

UNIT I

Introduction: Introduction to IT, Scope for IT, IT Usage, Information System, its functions and applications.

UNIT II

Hardware: Architecture (Mainframe, Mini, PC, Workstations), Real time system, Transaction Processing system, Laptop, Palmtop, Client server, N-Tier. **Introduction to Networks:** LAN, WAN, MAN, etc. **Peripherals:** Information about Input devices (Keyboard, Mouse, Joystick, Track ball, etc.) - Details about Storage devices (Floppy disk, Hard disk, Tapes (Cartridge, DAT), Compact Disk), Information about Monitors, Printers (impact, non-impact) - Various types of plotters.

UNIT III

Software: Software Classification (System, Application, and Utilities). **Operating System:** Introduction, Basic functions of OS, Classification of OS. **Programming Languages:** Generation of Languages and their uses. **Packages:** Spread sheets, DTP Tools, Presentation tools. Application areas of Software - Commercial, Scientific, Real time application etc.

UNIT IV

Multimedia and Internet: Introduction to multimedia - Hardware, Software and applications - Introduction to Internet, Service providers, Internet naming and addressing - Information about electronic mail, Remote login, File Transfer, Usenet-BBS, HTML. **Intranet, Extranet:** Introduction to Intranet and Extranet.

UNIT V

Object Oriented System: Concepts, Benefits of OOS over conventional system. **Enterprise Computing:** About ERP, Activities under ERP. **Mobile Computing -** An Introduction to Mobile Computing.

TEXT BOOKS

1. Brain, K. Williams, et. al., *Using Information Technology*, Third edition, TMH, 2000.
2. Turban, Rainer, Potter, *Introduction to Information Technology*, second edition, Wiley Publications.
3. Dennis P. Curtin, et.al., *Information Technology - The Breaking View*, TMH, 2000.

COMS 351: FUNDAMENTALS OF ALGORITHMS

UNIT I

INTRODUCTION : Algorithm - pseudo code for expressing algorithms – analysis - time complexity and space complexity - efficiency of algorithms - O-notation - Omega notation and Theta notation.

DIVIDE AND CONQUER : General method – binary search - merge sort - quick sort.

UNIT II

GREEDY METHOD : General method- Knapsack problem - job sequencing with deadlines - minimum-cost spanning trees : Prim's and Kruskal's algorithms - Single source shortest paths : Dijkstra's algorithm.

UNIT III

DYNAMIC PROGRAMMING : General method - Multistage Graphs – All pairs shortest paths, Single source shortest paths - optimal binary search trees - O/1 Knapsack problem - Traveling sales person problem.

UNIT IV

BACK TRACKING : General method - n-queen problem - sum of subsets problem - graph colouring - Hamiltonian cycles - Knapsack problem.

UNIT V

BRANCH AND BOUND : Least Cost(LC) search, Bounding - LC branch and bound - FIFO branch and bound - Travelling sales person problem.

TEXT BOOK

1. E. Howrowitz , Sahni, S.Rajasekaran, *Fundamentals of computer algorithms, G*algotia publications, 2004.

REFERENCES

1. Gilles Brassard and Paul Bratley, *Fundamentals of Algorithmics*, Prentice Hall of India Pvt.Ltd., 1997.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C,*Addition-wesley, Third Indian Reprint, 2000.

COMS 352: OBJECT ORIENTED PROGRAMMING

UNIT I

Limitations in structured programming – Characteristics of Object Oriented Language – data types – loops – pointers – arrays – structures – functions – Classes – Objects.

UNIT II

Operator overloading – Inheritance – Polymorphism – Templates – Exception Handling – class Hierarchies - library organization and containers – Strings – Stream - Design and programming.

UNIT III

Java vs. C++ - Java on the Internet – Exception handling – Multithreading and persistence – Java keywords and flow control – Garbage collection.

UNIT IV

Final declaration – Packages and interfaces – Java I/O classes – Run time type identification – User Interface design basics with swing.

UNIT V

Network programming – Applets – class - architecture - simple applet programs Abstract window tool kit.

Note: Unit I & II deals with C++ and Java
Unit III , IV & V deals with Java.

TEXT BOOKS

1. Bjarne Stroustrup, *The C++ Programming Language*, (3rd and Special Edition) Addison Wesley, 2000
2. Bruce Eckel, "*Thinking in Java*", (3rd Edition) Prentice Hall PTR, 2002

REFERENCES

1. Robert Lafore, *Object Oriented Programming in C++* , Galgotia publications, 4th Edition,2002.
2. E.Balaguruswamy, *Programming with Java*, Tata McGraw Hill Publications Limited, 2nd Edition ,1999.

COMS 353: OPERATING SYSTEMS

UNIT I

Introduction Early Operating Systems – Buffering & Spooling – Multiprogramming – Time Sharing – Protection – Operating System Structures.

Process Management: Process Concept – Hierarchy of Process – Critical Section Problem – Semaphores – Process Coordination Problems – Inter Process Communication

UNIT II

CPU Scheduling : Scheduling Concepts – Scheduling Algorithms – Algorithms – Algorithm Evaluation – Multiple Processor Scheduling

Deadlock: Deadlock Problem: Characterization – Prevention – Avoidance – Detection – Recovery – Combined Approach to Deadlock Handling.

UNIT III

Memory Management: Introduction – Multiple Partition – Paging – Segmentation – Paged Segmentation – Virtual Memory Concept – Overlays – Demand Paging and Performance – Page Replacement Algorithms – Allocation Algorithms – Trashing.

UNIT IV

Secondary Storage Management: Physical Characteristics – Disk Scheduling – Disk Scheduling Algorithms – Sector Queuing File Systems: File Operations – Access methods – Allocation Methods – Directory Systems – File Protection – Implementation Issues.

UNIT V

Case Studies: Linux and Windows 2000 Operating Systems.

TEXT BOOKS

1. Silberschatz, Peter Baer Galvin & Greg Gagne, *Operating System Concepts* Seventh Ed., Addison – Wesley Publications..

REFERENCES

1. William Stallings, *Operating Systems Internals and Design Principles*, PHI India, Fourth Edition, 2003.
2. H.M. Deitel, *Operating Systems*, Addison-Wesley, 2nd Edition.

COMS 401 : DATABASE MANAGEMENT SYSTEMS

UNIT I

Introduction to Database Systems: Overview – Data Models – Database System Architecture – History of Database Systems. Entity-Relationship Model: Basic Concepts – Constraints – Keys – Design Issues – Entity Relationship Diagram – Weak Entity Sets – Extended E-R Features – Design of an E-R Database Schema – Reduction of E-R Schema to Tables

UNIT II

Relational Model: Structure of Relational Databases – Relational Algebra – Extended Relational Algebra Operations – Modification of Database – Views – Tuple Relational Calculus – Domain Relational Calculus. SQL: Background – Basic Structure – Set Operations – Aggregate Functions – Null Values – Nested Subqueries – Views – Complex Queries – Modification of the database – Joined Relations – Data-Definition Language – Embedded SQL –Dynamic SQL – Other SQL Features. Other Relational Languages: Query-by-Example, Quel .

UNIT III

Integrity and Security: Domain Constraints – Referential Integrity – Assertions – Triggers – Security and Authorization – Authorization in SQL – Encryption and Authentication. Relational-Database Design: First Normal Form – Second normal form- Boyce-Codd Normal Form – Third Normal Form – Fourth Normal Form.

UNIT IV

Storage and File Structures: Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary Storage – Storage Access – File Organization – Organization of Records in Files – Data-Dictionary Storage. Indexing and Hashing: Basic Concepts – Ordered Indices – B^+-Tree Index Files – B-Tree Index Files – Static Hashing – Dynamic Hashing Index Definition in SQL – Multiple-Key Access

UNIT V

Transactions: Transaction concept – Transaction State – Implementation of Atomicity and Durability – Concurrent Executions – Serializability – Recoverability – Implementation of Isolation – Transaction Definition in SQL – Testing for Serializability

Concurrency Control: Lock-Based Protocols – Timestamp-Based Protocols – Validation-Based Protocols – Multiple Granularity– Deadlock Handling – Insert and Delete Operations.

Recovery System: Failure Classification – Storage Structure – Recovery and Atomicity – Log-Based Recovery .

TEXT BOOK

1. Silberschatz, Korth, Sudarshan, "*Database System Concepts*", 4th Edition – McGraw-Hill Higher Education, International Edition 2002. Chapters: 1 to 7, 11, 12, 15 to 17.

REFERENCES

1. Fred R McFadden, Jeffery A Hoffer, Mary B. Prescott, "Moden Database Management:, Fifth Edition, Addison Wesley, 2000.

2.Elmasri, Navathe, "Fundamentals of database Systems", Third Edition, Addison Wesley, 2000.

3.Jefrey D.Ulman, Jenifer Widom, "A First Course in Database Systems:, Pearson Education Asia, 2001.

4.Bipin C Desai, "An Introduction to Database Systems", Galgotia Publications Pvt Limited, 2001.

COMS 402 : COMPUTER NETWORKS

UNIT I

Introduction To Networks And Communication Media: Uses – Network Hardware – Network Software – Reference Models – Example Networks – Network Standardization. Basis for data communication - Transmission media – Wireless Transmission – Telephone Systems – Satellite Communication.

UNIT II

The Data Link Layer : Data Link Layer design issues – Error Detection and Correction Methods - Elementary Data Link Protocols – Sliding Window Protocols – Protocol Verification Methods – Channel Allocation – Multiple Access protocols – IEEE 802 Standards.

UNIT III

The Network Layer: Network Layer design issues – Routing algorithms – Congestion Control algorithms – Internetworking – Network Layer in Internet.

UNIT IV

The Transport Protocols: Transport Service – Transport Protocols – Internet Transport Protocols UDP – TCP - Performance issues.

UNIT V

The Application Layer: Application Layer design issues – Domain Name System - Electronic Mail – World Wide Web – Multimedia - Other Applications – Network Security - Basic Cryptography - DES - RSA.

TEXT BOOK

1. Andrews S. Tanenbaum, "*Computer Networks*", Prentice Hall of India Private Limited, (4^{th} Edition), 2003.

REFERENCE

1. Leon Garcia and Widjaja, *"Communication Networks - Fundamental concepts and key architecture"*, Tata McGraw Hill, 2001.

COMS 403: WINDOWS AND VISUAL PROGRAMMING

UNIT I

Introduction to Windows Programming: Different paradigms of programming – Comparison – Event driven programming – Windows programming fundamentals – Data types – Resources – Windows messages – Device contexts – Dynamic linking libraries.

UNIT II

Visual Basic Programming: Creating and using Controls – Menus and Dialogs – Programming fundamentals – Objects and instances – Programming user events – Using custom controls and grid control – inbuilt and user defined functions - Debugging - Creating graphics for application – File system controls - Accessing databases with the data controls – VB and the Internet.

UNIT III

Visual C++ Programming: Visual C++ components – Developing simple applications – Microsoft Foundation classes – Controls – Message handling – Document/view architecture – Reading and writing documents – SDI and MDI environments – splitter windows – co-ordination between controls.

UNIT IV

Database Connectivity : Mini database applications - Creating user defined DLL's - Dynamic data transfer functions - Database management with ODBC - Object linking and embedding.

UNIT V

Advanced Topics: Active x controls – COM – DCOM – COM+

TEXT BOOKS

1. Charles Petzold, "Windows Programming", 5th Edition Microsoft Press, 1998.
2. David Kruglirski. J, "Inside Visual C++", Microsoft press, 5th Edition,1998.
3. Deitel and Deitel, T.R. Nieto, "Visual Basic 6 – How to Program", Prentice Hall of India, 1999.
4 Garry Cornell, "Visual Basic 6 Ground Up", Tata McGraw Hill,1998.

REFERENCES

1. C.H. Pappas, W.H. Murray, III "*Visual C++: The Complete Reference*", Tata McGraw-Hill Publishing Company, 1999.

COMS 451: INTERNET PROGRAMMING AND WEB TECHNOLOGY

UNIT I

Networks , protocols, TCP/IP protocol suites, brief history of Internet, Internet Address, ports, sockets, Name Resolution, firewalls, protocol tunneling , proxy servers and Internet standards. WEB BASICS: history of web, Inside URL's web browsers, web servers, resources of Internet, H/W and S/W requirement of Internet.

UNIT II

HTML: Anatomy of HTML document, text basics, rules, images and multimedia, document layout and webs, formatted lists, cascading style sheets, forms, tables, frames and executable content. DHTML : Adding animation, multiplying the media, adding Interactivity (dragging and dropping) , working with data and dialog boxes, working with text, understanding browser object models, working with VB script and java script, embedding Active-X controls in web document.

UNIT III

Introduction to CGI - Perl : Introduction to CGI, Perl data structures, control structures, pattern matching and regular expressions, I/P and O/P in Perl, report formatting in perl, perl built –in functions, custom functions, references and anonymous data structures, object oriented programming in perl, advanced data manipulation, database programming with perl, perl-CGI programming, web programming with perl script.

UNIT IV

SERVELTS: Retrieving information, sending HTML information's, sending multimedia content, session tracking, security, database connectivity, Applet servelet communication, Interservelet communication. ASP : Basics- variables, ASP control structures, object – properties, methods and events- request and response objects, Application, session, cookies and error handling objects. Scripting objects, ASP components, Data store Access, using Record sets and building script components for ASP.

UNIT V

XML: Anatomy of an XML Document, markup elements and attributes, creating valid documents, developing advanced DTD's XML objects, checking validity, creating XML links, advanced addressing, viewing XML in browsers , processing , event-driven programming , programming with DOM, metadata, styling XML with css.

TEXT BOOKS

1. Chris Ullman, ' Beginning ASP 3.0', Wrox Press Ltd, 2001.
2. Chuckmusiano and Bill Kenndy, ' HTML The Definite Guide', O' Reilly publications, 2000.
3. Jason Hunter with William Crawford, 'Java Servelet programming, O' Reilly publications, 2000.
4. Joseph schmuller, 'Dynamic HTML', BPB publications,2000.
5. Micheal Mcmillan, 'Perl from the ground up', Tata Mcgraw- Hill Edition, 1999.

COMS 452 : AUTOMATA THEORY AND COMPILER DESIGN

UNIT I

Finite Automata and Regular Expressions: Deterministic and Non-Deterministic Finite Automata, Finite Automata with ε-moves, regular expressions – equivalence of NFA and DFA, two-way finite automata, Moore and Mealy machines, applications of finite automata.

UNIT II

Push Down Automata Theory: Context-Free Languages and Derivation Trees – Ambiguity in Context-Free Grammars – Chomsky Normal Form – Greibach Normal Form. Push Down Automata – Definition, Acceptance by Push Down Automata – Push Down Automata and Context Free Languages, properties of CFL

UNIT III

Introduction to Compiling: Compilers – Analysis of the source program – Phases of a compiler –Compiler construction tools

Lexical Analysis: Role of Lexical Analyzer – Input Buffering – Specification of Tokens.

UNIT IV

Basic Parsing Techniques – Shift reduce parsing- operator precedence parsing – Recursive descend parsing –predictive parsing –LR parsing – Simple LR parsing – canonical LR parsing – LALR parsing.

UNIT V

Intermediate Code Generation: Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls. Code Optimization: Principle Sources of optimization, Loop Optimization, DAG Representation of basic blocks, Global Data Flow Analysis.

Code Generation, Problems in code generation Register allocation and assignment, Code Generation from DAG's, Peephole Optimization.

TEXT BOOK

1. John E. Hopcroft and Jeffrey D. Ullman, *Introduction to Automata Theory, Languages and Computation*, Narosa Publishers, 2002.
2. A.V. Aho, J.D. Ullman, *Principles of Compiler design*' , Addison Wesley, 1998.

REFRENCE BOOKS

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "*Compilers Principles, Techniques and Tools"*, Pearson Education Asia, 2003.
2. Tremblay, A.S., and Sorenson, P.G., *'The Theory and Practice of CompilerWriting'*, McGraw-Hill Int. Edition, 1985.
3. Michael Sipser, "*Introduction to the Theory of Computations*", Brooks/Cole, Thomson Learning, 1997.
4. John c. Martin, "*Introduction to Languages and the Theory of Computaiton*", Tata McGraw-Hill, 2003.

COMS 453: SOFTWARE ENGINEERING

UNIT I

THE PRODUCT: The evolving role of software – Software.
THE PROCESS : Software Engineering: A Layered Technology – The software process – Software process models – Linear sequential model - Prototyping model – RAD model – Evolutionary software process models – Component based development – Formal methods model – Fourth generation techniques.

UNIT II
SOFTWARE PROJECT PLANNING: Observation on estimating – Software scope – resources – Software project estimation – Decomposition techniques – Empirical estimation models – Make buy decision.
PROJECT SCHEDULING AND TRACKING: Basic Concepts – Relationship between people and effort – Scheduling – Earned value analysis.

UNIT III
SYSTEM ENGINEERING: Computer based systems – The system engineering hierarchy – Business process engineering: overview – Product engineering: overview – Requirement engineering – System modeling.
ANALYSIS CONCEPTS AND PRINCIPLES: Requirement Analysis – Requirement elicitation for software – Analysis principles – Software prototyping – Specification.
ANALYSIS MODLEING: The elements of the Analysis model – Data Modeling – Functional modeling and information flow – Behavioral modeling – The mechanics of structured analysis – Data Dictionary.

UNIT IV
DESIGN CONCEPTS AND PRINCIPLES: Software design and software engineering – The design process – Design principles – Design concepts – Effective modular design – Design heuristics for effective modularity – Design Model – Design Documentation.
ARCHITECTURAL DESIGN: software Architecture – Data design – Architectural stykles – Mapping requirements into software architecture – Transform mapping –Transactional mapping – Refining architectural design.
USER INTERFACE DESIGN: The Golden rules – User interface design – Task analysis and modeling – Interface design activities – Implementation tools – Design evaluation.

UNIT V
SOFTWARE TESTING TECHNIQUES: Software testing fundamentals – Test case design – white box testing basis path testing – Control structure testing – Black box testing – Testing for specialized environments, architectures and applications
SOFTWARE TESTING STRATEGIES: A strategic approach to software engineering – Strategic issues – unit testing – Integration Testing – Validation testing – System testing – The Art of debugging.

TEXT BOOK

1. Roger S. Pressman, " Software Engineering. A Practitioners Approach", Sixth Edition, 2005

REFERENCES

1. C. Ghezzi, M. Jazayeri and D. Mandrioli, "Fundamentals of Software Engineering" ,Printice Hall of India Private Limited, 2nd Edition,2002.

2. Richard Farley , " Software Engineering Concepts", Tata McGraw Hill, 2003

COMS 501: COMPUTER GRAPHICS

UNIT I

Introduction, Overview of Graphics Systems, Video Display Devices, Refresh Cathode Ray Tubes, Raster Scan and Random Scan Displays, Raster Scan and Random Scan Display Processor, Color CRT Monitors, DBST, 3D Viewing Devices, Stereoscopic and VR Systems, Input Devices, Hard Copy Devices.

UNIT II

Output primitives, Line drawing algorithms, Circle Drawing algorithms, Circle drawing algorithms, Polynomials and spline curves, Area filling algorithms, character generation, Attributes of Output primitives, Line, Curve, Area fill, Character and bundled attributes, Anti aliasing techniques.

UNIT III

2D Transformations, 2D viewing, Graphical User interfaces and Interactive Input Methods.

UNIT IV

3D Concepts, 3D Transformations, 3D Viewing. Visible Surface Detection.

UNIT V

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring, Multimedia communication systems, Applications – Video conferencing – Virtual reality – Interactive video – video on demand

TEXT BOOK

1. Donald Hearn and M. Pauline Baker, “Computer Graphics”, 2nd Edition, Prentice Hall of India,2007.

2.Ralf Steinmetz, Klara steinmetz, "Multimedia Computing, Communications and Applications", Pearson education, 2004

REFERENCES

1. Steven Harringhton, “Computer Graphics – Programming Approach”, McGraw Hill, 2nd Edition.
2.Roy A. Plastock and Gorden Kelley, “Theory and Problems of Computer Graphics”, Schaum’s Outline Series, McGraw Hill,2007.

COMS 502 : MANAGEMENT CONCEPTS AND STRATEGIES

UNIT I

Management: Science Theory and Practice - Management and Society: Social responsibility and Ethics. The nature and purpose of planning - objectives - Strategies Policies and planning premises.

UNIT II

Decision making. The Nature and purpose of organizing - Basic departmentation - Line / staff Authority and decentralization - Effective Organizing and organizational culture.

UNIT III

Human Resource Management and selection - Performance appraisal and career strategy - Manager and organizational development.

UNIT IV

Managing and the Human factor - Motivation - Leadership - communication.

UNIT V

The system and Process of controlling control techniques and information Technology - Productivity and Operations Management - Overall and Preventive Control - Towards a unified, Global management theory.

TEXT BOOKS

1. Herald Knootz and Heinz Weihrich, "*Essentials of Management*", McGraw-Hill Publishing Company, Singapore International Edition, 2000.

2. Ties AF, Stoner and R.Edward Freeman "*Managemen*t" Prentice Hall of India Pvt., Ltd., New Delhi 110 011, 2003.

3. Joseph l, Massie, "*Essentials of Management*", Prentice Hall of India Pvt., Ltd., New Delhi 110 011, 2002.

COMS 223: FOREIGN LANGUAGE – FRENCH I

UNIT I
PAROLES ET GESTES

Objectifs linguistiques
- saluer
- se présenter
- présenter quelqu'un

UNIT II
CHIFFRES ET LETTRES

Objectifs linguistiques
- demander une information
- demander quelque chose

UNIT III
A PARIS

Objectif linguistique
- donner son opinion

UNIT IV
ACTIVITÉS ET PRÉFÉRENCES

Objectifs linguistiques
- exprimer ses préférences
- proposer / accepter ou refuser une proposition

UNIT V
AU FIL DES HEURES

Objectifs linguistiques
- préciser son identité
- s'excuser et se justifier
- dire l'heure

TEXT BOOK

1. Pierre GILBERT & Philippe GREFFET, BONNE ROUTE – Méthode de Français Paris: Alliance Française / Hachette, 1988.

COMS 224: FOREIGN LANGUAGE – FRENCH II

UNIT I
AU FIL DES HEURES

Objectifs linguistiques
- préciser son identité
- s'excuser et se justifier
- dire l'heure

UNIT II
TRAVAIL ET LOISIRS

Objectifs linguistiques
- parler de soi
- exprimer un jugement
- exprimer un souhait

UNIT III
AUTOUR DE NOUS

Objectifs linguistiques
- interroger sur le temps
- présenter des personnes

UNIT IV
DES GENS, UNE VILLE … LES JOURS

Objectifs linguistiques
- caractériser des personnes, des lieux
- donner son opinion
- compter jusqu'à 99

UNIT V

OU SONT-ILS ? OU VONT-ILS?

Objectifs linguistiques
- demander et donner des informations pratiques
- savoir téléphoner
- communiquer

TEXT BOOK

1.Pierre GILBERT & Philippe GREFFET, BONNE ROUTE – Méthode de Français Paris: Alliance Française / Hachette, 1988.

COMS 225: COMMUNICATION SKILLS

UNIT I

Session–I: Communication: Concepts and definition - Importance - Process- communication - Model - Types - Mode of communication - Objectives - Inter, Intra personal Communication - Barriers - Commandments of communication.

Session–II: Developing Communication Skills: a) Reading: Preparation - Reading Styles - Linear reading - Faster Reading - Reading Techniques **b) Writing:** Effective writing - Report writing - Speech Writing - Minutes - Communication aids - Agenda Writing - Letters - Article writing - Improving English language Writing - When to write and when not to write.

Session–III: Listening and Speaking: a) Listening: Listening - Importance - Art of Listening - Advantages - Mode of expression - Listening tests **b) Speaking:** Art of conversation - Using telephone - Methods of asking questions - Brain Storming - Presenting reports -Improving speech delivery - Expressing Techniques

UNIT II

Session-IV: Interviews Techniques: What and Why? - Types of Interviews - Understanding the intricacies - Planning for interviews - Answering skills - Effective Communication during interviews - TIPS - Mock Interview.

Session–V: Group Discussion: Group Discussion - Purpose - Process of Group Discussion - Preparation - Getting Started - Art of guiding and controlling discussion - Personality test through group discussion - Lateral thinking - Participation techniques - mock G.D.

UNIT III

Session–VI: Body Language: Origin and development of body language - Tool for personality identification - Analysis of body language - Types - Desirable body language - Attitude and body language - Body language as a powerful communication.

Session–VII: Negotiation Techniques: Meaning - Importance - Fundamentals - Preparation - Techniques of Negotiation - Managing process of negotiation - Inter-personal haviour - Case Study - Mock negotiations

Session–VIII: Meetings: Meaning - Importance - Objectives - Leading and participating in meetings - Success indicators - Understanding the process of meetings - Communication skills for meetings - Mock Meetings - Seminars.

UNIT IV

Session-IX: Management Communication Relationships: Communication in Management - Semantics - Employee and Employer communication - Communication within Management - Downward and Upward communication - Communication by specialists - The Union's role in communication.

Session-X: Presentation: Meaning and types of presentation - Understanding the audience - Planning - Designing - Written and oral - Making use of notes and outlines _ Techniques for delivering presentation - personal style - A postscript - model presentation

UNIT V

Session - XI: A whole review of the ten sessions and evaluation of the students.

Session – XII: Practical communication with a cross section of the society.

COMS 226: ACCOUNTING AND FINANCIAL MANAGEMENT

UNIT I

Accounting: Principles, Concepts, Conventions, Double entry system of accounting, Introduction to basic books of accounts, Sole proprietary concern, Control accounts for debtors and creditors, closing of books of accounts and preparation of Trial balance. **Final Accounts:** Trading and profit and loss account, Balance sheet of sole proprietary concern with normal closing entries. **Depreciation:** Meaning.

UNIT II

Financial Management: Scope – functions – jobs of financial managers. **Ratio Analysis:** Meaning - Advantages – Limitations – Types of ratio and their applicability.

UNIT III

Fund flow Statement: Meaning of the term fund – flow of fund – working capital cycle – preparation and interpretation of fund flow statement – Cash flow statement. **Costing Nature –Importance –** Basic principles.

UNIT IV

Budget and budgetary Control: Nature and scope – Importance – types of budgets – methods of finalization of flexible budget. **Marginal Costing:** Natures, scope and Importance- Break Even - Analysis, Uses and its Limitations.

UNIT V

Standard Costing: Nature and scope – Computation and analysis of variances with reference to material cost – Labor cost – Overhead cost – Interpretation of the variances.

TEXT BOOKS

1. Jain and Narang, "Financial Accounting", Sultan and Chand Co.
2. R.L. Gupta and V.K. Gupta, "Introduction to Financial Accounting", Sultan and Chand Co.
3. S.N. Maheswari, "Principles of Management Accounting", Sultan and Chand Co.
4. S.P Jain and Narang, "Advanced Cost Accounting", Kalyani publishers, Delhi.
5. S.P. Iyengar, "Cost and Management Accounting", Sultan and Chand Co.
6. S.C.Kuchhal, Financial Management, Chaitnaya publishing House, Allahabad.

COMS 520: BUSINESS PROCESS

UNIT I

Nature and Types of Business Organizations – Introduction to Business Process - Organization Structure – Definition – Complexity – Formalization – Outcomes for individuals – Size – Technology – Internal culture – Environment – National cultures – IT Industry Scenario.

UNIT II

Recognizing a Creation Company - The WHOOSH – Beginners mind - Creation Company Vs. Compliance Company.

UNIT III

Becoming a Creation company – Choosing to change – the art of collaboration – Models. Leading a Creation Company – Freedom and Focus – Creation Leadership.

UNIT IV

Introduction to Business Process Reengineering – Business Process Reengineering through IT – People view – Case Study – Empowering through IT.

UNIT V

Introduction to e-Business – Rules of e-Business – e-business execution framework - Trend spotting – Construction steps of e-business design – Case studies – Constructing the e-business architecture.

TEXT BOOKS

1. Richard H. Hall,*Organizations, Structures, Processes, and Outcomes,* Pearson Education, 2001.
1. M. S. Jayaraman et. al., *Business Process Reengineering,* Tata McGraw Hill publications, 2001.
2. Tom McGehee, *Whoosh: Business in the Fast Lane*, Perseus Publication, 2002.
3. R. Kalakota and M. Robinson, *e-Business : Roadmap for Success*, Pearson Education, 2000.

COMS 521: INTRODUCTION TO PROGRAMMING

UNIT I

Introduction to Problem Solving - Flow charts - Tracing flow charts - Problem solving methods - Need for computer languages - Sample Programs written in C

UNIT II

C Language preliminaries - C character set, Identifiers and keywords, Data types, Declarations, Operators and expressions, statements and symbolic constants - Storage types

UNIT III

Arrays - Strings - Input-Output functions - Pre-processor commands – Preparing, compiling and running a complete C program

UNIT IV

Functions -Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static Functions - Structures - Defining and processing. Passing to a function – Unions

UNIT V

Files – Defining and processing – File operations - Pointers - Declarations, Passing pointers to a function, Operations on pointers - Searching – Sorting – String processing – applications using structures and files

TEXT BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall, Inc., Second Edition, 2007.
2. Gottfried, Byron.S, “Schaum's outline of theory and problems of programming with C”, McGraw-Hill Professional, 1996.
3. R.G.Dromey, “How to Solve it by Computer”, Prentice-Hall Inc., 1982.

COMS 522: INTRODUTION TO PC & ITS UTILITIES

UNIT I

Introduction to computers: Basic components , Hardware & Software resources, Number system: Decimal, Binary, Octal, Hexadecimal, conversions, Introduction to Windows operating system, components of windows OS, Desktop properties, GUI.

UNIT II

Introduction to Microsoft Word: Various formatting Techniques, Mail merge, Tables and other features.

UNIT III

Introduction to Microsoft Excel: Worksheets, Chart wizards, function wizard and other features.

UNIT IV

Introduction to Microsoft power point: Various views, slide layout, inserting pictures and sounds, custom animation and other features.

UNIT V

Introduction to Internet , Getting connected to internet , internet features, protocols, E-mail, Internet explorer & Outlook express.

TEXT BOOKS

1. N.Krishnan,"Windows & MSOffice 2000 with database concepts",Scitech Publications,2001.
2. N.Krishnan, "Computer fundamental & windows with Internet Technology".
3. Alexis Leon & Mathews Leon, "Internet for every one",Vikas publishing house private Ltd,2001.

COMS 523: SYSTEM SOFTWARE

UNIT I

INTRODUCTION TO SYSTEM SOFTWARE AND MACHINE STRUCTURE : System programs – Assembler, Compiler, Interpreter, Operating system. Machine Structure – instruction set and addressing modes.

UNIT II

ASSEMBLERS : Basic assembler functions, machine–dependent and machine independent assembler features. Assembler design – Two-pass assembler with overlay structure, one – pass assembler and multi - pass assembler.

UNIT III

LOADERS AND LINKERS : Basic loader functions, machine–dependent and machine – independent loader features. Loader design – Linkage editors, dynamic linking and bootstrap loaders.

UNIT IV

MACROPROCESSORS : Basic Macroprocessor functions – machine independent features, Macroprocessor design – recursive, one pass macroprocessor –two pass macroprocessor-general-purpose and macroprocessing with language translators.

UNIT V

DEBUGGERS : Introduction-debugger architecture-H/W debugger facilities-OS debugger infrastructure- controlling execution-breakpoints and single steping-inspecting data and variables – debugging GUI applications.

TEXT BOOKS

1. Leland L. Beck , "*System Software – In introduction to System Programming*", Addison Wesley,(Chapter 1,3,4,5,7.2 & 7.3) 3rd Edition,1996.
2. Jonathan B. Rosenberg, "*How Debuggers Work : Algorithms, Data Structures, and Architecture"*, John Wiley & Sons -1 edition (September 27, 1996)

REFERENCE

1. Damdhare, "Introduction to System Software", Mcgraw Hill 1987.

COMS 524 : OPERATION RESEARCH

UNIT I

Overview of Operations Research – Concept of Linear Programming Model – Graphical Method – Linear Programming Methods – Duality

UNIT II

Transportation Problem – Assignment Problem – Network Techniques

UNIT III

Integer Programming – Formulations – Cutting-plane Algorithm – Branch-and-Bound Technique – Zero-One Implicit Enumeration Technique

UNIT IV

Inventory Control – Queuing Theory

UNIT V

Dynamic Programming – Project Management – Replacement and Maintenance Analysis

TEXT BOOK

1. R.Panneerselvam, " Operations Research", Prentice Hall of India, 2002. Chapters 1 to 13

REFERENCES

1. S.Dharani Venkatakrishnan, " Operations Research – Principles And Problems", Keerthi Publishing House, 1992
2. Kanti Swarup, Manmohan, P.K.Gupta, " Operations Research", Sultan Chand & Sons, 2008.

COMS 525 : TCP/IP

UNIT I

Introduction : Inter Networking concept – Application level – Network level Interconnection – Internet Architecture – Inter Connection through IP Routers, Internet Addresses – Mapping Internet addresses to Physical addresses (ARP) – Determining an Internet address at startup (RARP).

UNIT II

Internet Protocol : Datagram delivery – Routing IP datagrams, error and control messages (ICMP) – classless and subnet addresses extensions – User Datagram Protocol (UDP).

UNIT III

Routing Protocols: Routing cores – peers – routing algorithms – Autonomous Systems – Exterior Gateway Protocol – Internet Multicasting – Multicast Routing Protocols – Internet Group Management Protocol (IGMP).

UNIT IV

TCP/IP over ATM : ATM hardware – ATM cell transport – Adaptation Layer – IP address binding in ATM network – Logical IP subnet – ATMARP. **Socket Interface :** Unix I/O – networks I/O – creating sockets – connecting sockets – obtaining information about hosts, networks, protocols, services.

UNIT V

Application Protocols : Domain Name System – File transfer & access (FTP, TFTP, NFS) – electronic mail (SMTP, MIME) – Network management (SNMP) – Internet security.

TEXT BOOK

1. Douglas E. Comer, *"Internetworking with TCP/IP Principles, Protocols and Architectures"*, Prentice Hall of India Private Limited, (4th Edition), 2002.

REFERENCES

1. Behrouz A Forouzan, *"TCP/IP Protocol Suite"*, Tata McGraw-Hill, 2000

COMS 526: ARCHITECTURE OF UNIX

UNIT I

Introduction to Kernel: System concepts – Kernel data structures – Buffer cache. **File representation:** Inodes – Structure of a regular file – Directories – Conversion of a path name to an Inode - Super block – Inode assignment – Aloocation of disk blocks - System Calls for File system.

UNIT II

Process Structure: Process states and transitions – Layout of system memory – Context of a process – Saving the context – Manipulation of process address space – Sleep. **Threads and Lightweight process**: Fundamentals of threads – Lightweight process design – Multithreading in Solaris – Threads in Mach, Digital UNIX.

UNIT III

Process Control: Process creation – termination – Invoking the process – User ID of a process – Changing the size of the process – The Shell – Init process - Signal generation – Reliable and Unreliable signals – Exceptions. **Process Scheduling**: Time - Clock interrupt handling – Scheduler goals – Traditional UNIX scheduling – Solaris, SVR4, and MACH schedulers.

UNIT IV

Interprocess Communications: Process tracing – System V IPC – Messages – Ports – Message passing – Port operations. **Synchronization and Multiprocessing**: Synchronization in traditional UNIX kernels – multiprocessor systems – Master and slave processes – Semaphores – Spin locks – Conditional variables – Read-write locks.

UNIT V

I/O subsystem: Driver interface – Disk drivers – Device driver frame work – POLL system call – Block I/O. **Streams:** Messages and queues – Stream I/O – Configuration and setup – Multiplexing – FIFOs and pipes – Network interface.

TEXT BOOKS

1. Maurice J.Bach, *"Design of UNIX Operating Systems*," Prentice Hall of India, 1994.
2. Uresh Vahalia, "*UNIX Internals-The new frontiers*," Pearson education, 2001.
3. Graham Glass and King Ables, "*UNIX for programmers and Users*," Pearson education, 3rd edition, 2003.

COMS 527: PRINCIPLES OF PROGRAMMING LANGUAGES

UNIT I

Language design Issues: Reasons for studying concepts of programming language – language evaluation criteria- influences on language design- structure and operation of computer – virtual computers and binding times- language paradigms.

UNIT II

Data types: Properties of types and objects-elementary data types- structured data types. **Abstraction:** Abstract data types-encapsulation by subprograms-type definition- storage management.

UNIT III

Sequence Control : Implicit and explicit sequence control- sequencing with arithmetic and non-arithmetic expressions-sequence control between statements**. Subprograms control**: subprogram sequence control- attributes of data control – shared data in subprograms.

UNIT IV

Inheritance: Inheritance- polymorphism; **Language Translation Issues:** Programming language syntax- stages in translation- formal translation models.

UNIT V

Advances in language design: variations on subprogram control- language constructors for parallel processing language semantics-software architecture.

TEXT BOOKS

1. Terrance W.Pratt, Marvin V Zelkowitz, "*Programming Languages, Design and Implementation"*, PHI, 2002, (4th edition).

REFERENCES

1. Ravi Sethi, "*Programming Languages – Concepts & Constructs*", Addison-Wesley, (2^{nd} edition),1996.
2. E.Horowitz, "*Fundamentals of programming languages*", Galgotia Publishers,1984.
3. A.B.Tucker, Robert, Noonan,"*Programming Languages*", McGraw Hill,2002.
4. D.Appleby, J.J.VandeKopple, "*Programming languages – Paradigm and practice*", McGraw Hill, International Editions, (2^{nd} edition), 1997.

COMS 528: MIDDLEWARE TECHNOLOGY

UNIT I

Client – Server – File Server, Data Base Server, Group Server, Object Server, Web Server
Middleware – General Middleware – Service Specific Middleware
Client – Client Server Building blocks – RPC – Messaging – Peer-to-Peer

UNIT II

EJB – EJB Architecture – Overview of EJB Software Architecture – View of EJB Conversation – Building and Deploying EJBs – Roles in EJB

UNIT III

EJB Session Beans – EJB Entity Beans – EJB Clients – EJB Deployment – Building an Application with EJB

UNIT IV

CORBA – Distributed Systems – Purpose – Exploring CORBA alternatives – Architecture Overview – CORBA and Networking Model – CORBA Object Model – IDL – ORB – Building an Application with CORBA

UNIT V

COM – Data Types – Interfaces – Proxy and Stub – Marshalling – Implementing Server/Client – Interface Pointers – Object Creation, Invocation, Destruction – Comparison of COM and CORBA

TEXT BOOKS

1. Robert Orfali, Dan Harkey, Jeri Edwards, '*The Essential Client/Server Survival Guide'*, Galgotia Publication Pvt. Ltd., 2002.
2. Tom Valesky, '*Enterprise JAVA Beans'*, Pearson Education, 2002.
3. Jeremy Rosenberger, '*Teach Yourself CORBA in 14 days'*, Techmedia, 2000.
4. Jason Pritchard, '*COM and CORBA side by side',* Addison Wesley, 2000.

REFERENCES

1. Mowbray, '*Inside CORB*A', Pearson Education, 2002.

COMS 529: IMAGE PROCESSING

UNIT I

DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS: Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

UNIT II

IMAGE ENHANCEMENT TECHNIQUES: Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.

UNIT III

IMAGE RESTORATION: Model of Image Degradation/restoration process – Noise models – Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition.

UNIT IV

IMAGE COMPRESSION: Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM.
Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.

UNIT V

IMAGE SEGMENTATION AND REPRESENTATION: Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors –Simple descriptors- Texture

TEXT BOOKS

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education 2003.

REFERENCES

1. William K Pratt, Digital Image Processing John Willey (2001)
2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).
3. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
4. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000

COMS 530: MULTIMEDIA SYSTEMS AND APPLICATIONS

UNIT I

Introduction: Multimedia elements – multimedia applications – System architecture – evolving technologies – defining objects – data interface standards – need for data compression – multimedia databases

UNIT II

Multimedia data compression: Types of compression – Binary image compression – color, gray scale and still video image compression – video image compression – audio compression – fractal compression. Data and file formats: RTF – TIFF – RIFF, MIDI, JPEG, AVI video file formats, MPEG standards.

UNIT III

Multimedia I/O technologies: Pen input – Video and Image display systems – Print output technologies image scanners – digital voice and audio – digital camera – Video images and animation – full motion video. Multimedia storage and retrieval technologies: magnetic media technology – optical media – hierarchical storage management – cache management for storage systems.

UNIT IV

Multimedia application design: Types of Multimedia systems – Virtual reality design – components of multimedia systems – organizing multimedia databases – application work flow design issues. Multimedia authoring systems: Hypermedia application design considerations – user interface design – information access – object display / playback issues.

UNIT V

Distributed Multimedia Systems: Components – Distributed Client-Server operation – multimedia object servers – Multi-Server network topologies – Distributed multimedia databases – Managing distributed objects.

TEXT BOOKS

1. Prabhat K. Andleigh, Kiran Thakrar, "*Multimedia Systems Design*", PHI 2002.

REFERENCES

1. Tay Vaughan, "*Multimedia making it works*" Fifth Edition, TMH, 2001.
2. Jeffery Jefcoat, "*Multimedia Systems and Application*", TMH.
3. Fred Halsall, "*Multimedia Communication Application Networks, Protocols and Standards*", Addison Wesley, 2001.

COMS 531: E-COMMERCE

UNIT I

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 II

Approaches to safe Electronic Commerce: Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET)- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash

UNIT III

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.

UNIT IV

MasterCard / Visa secure Electronic Transaction: Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce:Introduction – The Mean of Distribution – A model for message handling – How does e-mail work? MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services

UNIT V

Internet and Web site establishment: Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet

TEXT BOOKS

1.Daniel Minoli & Emma Minoli, "Web Commerce Technology Handbook", TataMcGraw-Hill , 1999.
2. K.Bajaj & D. Nag, "E-Commerce", TataMcGraw-Hill, 1999.

COMS 532: NEURAL NETWORKS

UNIT I

Introduction, Characteristics of Artificial Neural Networks, Learning in Biological systems and machines, Brain and Computers, Differences in simple neurons.

UNIT II

Perceptron and representation, Learning , Linear separability, Problems with the perceptron training algorithms, Multilayer perceptron, Back propagation training algorithm, Learning difficulties, Applications.

UNIT III

Counter propagation networks, Normal operation, training, Full counter propagation networks, Applications to data compression, Khonen network algorithm, Neighborhoods. Hopfield Nets, Learning, The energy landscape, Storing and recall of patterns, Learning in Boltzman machines, Learning , Applications.

UNIT IV

Statistical methods, Training, Application to general non-Linear optimization problem. Adaptive Resonance Theory, Architecture, Classification, Implementation, Training aids, Characteristics.

UNIT V

Associative memory, Bi-directional associative memory, Structure of types. Optical Neural Networks, Vector matrix multipliers, Holographic correlators, Hopfield net using electro optical matrix multipliers and volume holograms. The cognitron structure, Training, Lateral inhibition, The NeoCognitron structure, Generalization, Training, Application of Neural nets, Pattern Recognition, Decision making system, Medical diagnosis. Recent trends in Neural Nets.

TEXT BOOK

1. Philip D Wasserman, “Neural Computing – Theory and Practice”, Van Nostrand and Reinhold, 1989.

REFERENCES

1. James A Freeman and David M Skapura, “Neural Networks Algorithms, Application and Programming Techniques”, Addison Wesley Publishing Company, 1991.

COMS 533: .NET FRAMEWORK AND C#

UNIT I

Introduction to the .NET Platform – Common Language Runtime(CLR) – The Common Type Specification(CTS) – The Common Language Specifications (CLS) – Assemblies - .NET Base Classes – CLR Debugger.

UNIT II

Introduction to C# - Data Type – Operators – Flow Control and Iteration – Arrays and Strings – Basics of C# Classes – Boxing and Unboxing – Reflection – Interoperability – The Preprocessors – Attributes – Name Spaces.

UNIT III

Object-Oriented Programming in C# - Encapsulation, Inheritance , and Polymorphism – Exception Handling – Garbage Collection – Input and Output (Directories ,Files, and Streams).

UNIT IV

Implementing the IC1oneable and IComparable Interfaces – Introduction to .NET Collections (including Custom Collections) – Custom Indexers, Delegates and Events – Multithreading and Synchronization – Type Reflection and Attributes – Programming the Windows Registry.

UNIT V

GDI+ Graphics Tutorial(including Fonts, Brushes,Images, and using .NET Resources) – COM, COM+, and .NET Interoperability – ADO.NET for Database Programmin with Datasets and Object Model. – Windows Applications: Winforms – Winforms Namespace – Creating Winforms Applications in VS.NET – Developing Windows Applications.

TEXTBOOKS

1.Robert J.Oberg, “Introduction to C# using .NET”,PHI,2002.
2.Andrew Troelsen, “C# and .NET Platform**”,** Apress, 1st edition,2001.

REFERENCES

1.Ben Albahari, Peter Drayton and Brad Merrill, “C# Essentials”,SPD,2001.
2. “Microsoft C# Language Specifications”, WP Publishers and Distributors Pvt.Ltd.,2001

COMS534: CLIENT SERVER SYSTEMS

UNIT I

Client/Server System concepts: Introduction, concepts, N-Tier vs 2-Tier Client/Server Architecture, 2-Tier Architecture, 3-Tier Architecture, Case study of N-tierArchitecture, Client/Server Models, Gartner Classifications, Middleware, Database connectivity and its need, Upsizing, Down sizing, Right sizing, Characteristics, Types of Servers and Clients.

UNIT II

Client/Server System Architecture: Client/Server building blocks, Hardware, software, Middleware, Types of Middleware, DLE, MOM, Transaction Processing Monitors, ODBC, Need for Database Connectivity, Design Overview of ODBC, Architecture, Components, Applications, Driver Managers, Drivers, Data Sources, ODBC 2.5 and ODBC 3.0, Operating System Services, Base Services, External Services, Server Scalability.

UNIT III

Client /Server Databases: SQL Database Servers, Server Architecture, Multithread Architecture, Hybrid Architecture, Stored Procedures, Triggers, Rules of Client/Server Transaction Processing, Transaction Models, Chained and Nested Transactions, Transaction Management Standards, Distributed Database characteristics, Data Warehousing, Data Mining.

UNIT IV

Client/Server Protocols: RPC, IPC.

UNIT V

Recent Trends in Client/Server Computing: Intranet, Extranet, Internet, CORBA, etc.

TEXT BOOKS

1.Robert Orfali, Dan Harkey, Jerri Edwards "The Essential Client Server Survival Guide" III Edition, Wiley Publications,1999.
2.Alex Berson, “Client/Server Architecture”, Tata McGrawHill publications,1992.
3.Neil Jenkins et al., “Client/Server Unleashed”,1996.

COMS 535: CRYPT ANALYSIS AND SECURITY PRINCIPLES

UNIT I

Symmetric Ciphers – Classical Encryption Techniques – Symmetric Cipher Model , Substitution Techniques , Transposition Techniques , Steganography – Block Ciphers and the Data Encryption Standard – Simplified Data Encryption Standard , Block Cipher Principles , The Data Encryption Standard, Strength of Data Encryption Standard, Differential and Linear Cryptanalysis , Block Cipher Design Principles , Block Cipher Modes of Operation.

UNIT II

Advanced Encryption Standard – Evaluation Criteria for Advanced Encryption Standard , The Advanced Encryption Standard Cipher – Substitute Byte Transformation – Contemporary Symmetric Ciphers – Triple Data Encryption Standard , Blowfish ,RC5 , Characteristics of Advanced Symmetric Block Ciphers – Confidentiality using Symmetric Encryption – Key Distribution.

UNIT III

Public Key Cryptography and RSA – Principles – RSA Algorithm, Key Management and other Public Key Cryptosystems – Key Management , Diffie-Hellman Key Exchange, Elliptic Curve Cryptography , Manage Authentication and Hash Functions – Authentication Requirements ,Authentication Functions , Manage Authentication Codes.

UNIT IV

Digital Signatures and Authentication Protocols – Digital Signatures , Authentication Protocols , Digital Signature Standard.

UNIT V

Network Security Practice – Authentication Applications – Kerberos , X.509 Authentication Service – Electronic Mail Security – PGP , Secured MIME, IP Security – Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload.

TEXT BOOK

1. William Stallings, “CRYPTOGRAPHY & NETWORK SECURITY - Principles and Practices”, Fourth Edition , Pearson Education,2005.

COMS 536: ATM NETWORKS

UNIT I

Introduction : ATM – Historical Perspective – Protocol Architecture – Logical Connections – Cells – Transmission of ATM Cells – SDH – SONET – Switches.

UNIT II

ATM Protocol: Connection Setup – Routing Switching , Signaling , ATM Service Categories – QOS Parameters – Adaptation Layer.

UNIT III

Routing Issues: Routing for High Speed Networks – RSVP, Traffic and Congestion Control – Achieving QOS – Traffic Shaping – Generic Cell Rate Algorithms – Rate Based Congestion Control – Connection Admission Control.

UNIT IV

High Speed LANs: Fast Ethernet – ATM LAN's – LANE.

UNIT V

Protocols Over ATM: Multiple Protocols Over ATM, IP Over ATM , TCP Over ATM – Real Time Transport Protocol – Wireless ATM – Current Trends.

TEXTBOOKS

1. Rainer Handel, Manfred N.Huber, Stefan Schroder, "ATM Networks", Addison Wesley,1999.

REFERENCES

1. William Stallings, "High Speed Networks TCP/IP and ATM Design Principles",Prentice Hall International ,1998.

2. Uyless Black, "ATM Vol.1 and 2",PHP TR,1999.

3. William Stallings, "ISDN with Broad Lane ISDN with Frame Relay and ATM",PHI,Fourth Edition,1999.

COMS 537: COMPONENT SOFTWARE

UNIT I

Components are for Composition-Components –Custom-made versus standard software-Inevitability of Components-Standards-Importance of Standards-Foundation-Components, Objects, Modules, Interfaces, Component "Weight"-Object Vs Class Composition-Inheritance, Approaches to Disciplined Inheritance.

UNIT II

Patterns, Framework, Architecture-Component Models and Platforms-Object And Component Using Standards-From procedures to Objects-Specification of Interfaces and Object Interface Relationships and Polymorphism-CORBA,CORBA Component Model-Java Component Technology- Applet, Servlets, Beans,Enterprise Beans.

UNIT III

The Microsoft Way-COM Object range,COM Object Creation-From COM To DCOM-Component Document and OLE-Contextual Compositioin And Services-COM Apartments-MTS,COM+.

UNIT IV

Component Architecture-Component Frameworks-Component Framework Vs Connectors-Component Frameworks Vs Aspect Oriented Programming-Framework for Contextual Composition-Black Box Component Framework.

UNIT V

Component Development-Component oriented Programming, Problem Of Asynchrony -MultiThreading -Living Without Implementation Inheritance-Component Distribution And Acquisition-Component Assembly.

TEXTBOOK

1. Clemens Szyperski, "Component Software", Pearson Education-First Print-2004.

COMS 538: DISTRIBUTED DATABASE SYSTEMS

UNIT I

Introduction : Distributed data processing, distributed database design, distributed query processing, distributed directory management, distributed concurrency control, distributed deadlock management, reliability of distributed DBMS, operating system support, heterogeneous databases. Overview of Relational DBMS

UNIT II

Review of computer networks : Data communication concepts, types of networks, protocol standards, broadband networks, wireless networks, Internet. Distributed DBMS Architecture : DBMS standardization, architectural model for distributed DBMS, Distributed DBMS Architecture : client/server systems, peer-to-peer distributed systems.

UNIT III

Distributed Database Design : Alternative design strategies : top-down design process, bottom-up design process, distribution design issues : reasons for fragmentation, fragmentation alternatives, degree of fragmentation, correctness rules of fragmentation, allocation alternatives, information requirements, fragmentation : horizontal fragmentation, vertical fragmentation, hybrid fragmentation.

Semantic data control : View management: views in centralised DBMS, updates through views, views in distributed DBMS.

Data security : centralized authorization control, distributed authorization control.

UNIT IV

Distributed Concurrency Control : Locking-based concurrency control algorithm, timestamp-based concurrency control algorithms : basic TO algorithm, conservative TO algorithm, optimistic concurrency control algorithms

Deadlock management : deadlock prevention, deadlock avoidance, deadlock detection and resolution.

Distributed DBMS Reliability : System, state and failure, reliability and availability, mean time between failures/mean time to report, failure and fault tolerance in distributed systems : reasons for failures, basic fault tolerance approaches and techniques.

UNIT V

Distributed Object Database Management: Object, abstract data types, composition, class, collection, subtyping and inheritance, Object distribution design : horizontal class partitioning, vertical class partitioning , path partitioning, class partitioning algorithms, allocation, replication.

TEXT BOOK

1.M.Tamer Ozsu-Patric Valduriez, "Principles of Distributed Database System" II Edition, Pearson Education.

COMS 539: AI AND EXPERT SYSTEMS

UNIT I

Problem solving and AI, Puzzles and Games, Problem States and Operators, Heuristic programming, state space representations, state descriptions, graph notations, non-deterministic programs.

UNIT II

State space search methods, breadth first and depth first search, heuristic, admissibility, optimality of algorithms, performance measures, problem reduction representations, AND/OR graphs and higher level state space.

UNIT III

Problem reduction search methods, cost of solution trees ordered search, alpha beta and minimum procedure, theorem proving in predicate calculus, syntax, semantics,
Herbrand universe: variables, qualifiers, unification, resolvents.

UNIT IV

Predicate calculus in problem solving, answer extraction process, resolution, automatic program writing, predicate calculus, proof finding methods.

UNIT V

Expert Systems: Expert systems and conventional programs, expert system organization, **Knowledge Engineering:** knowledge representation techniques, knowledge acquisition, acquiring knowledge from experts, automating knowledge acquisition. Building an expert system: Architecture of an expert system, ask in building an expert system, difficulties in developing an expert system.

TEXT BOOKS

1.E. Charniak, C. K. Reiesbeck and D. V. Mcdermett, “Artificial Intelligence Programming”, Lawrence Erlbaum Associates, N.J., 1987.
2.N. J. Nilsson, “Principles of Artificial Intelligence”, Tiega Press, Polo Alto, 1986.
3.Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw Hill, 1991.
4.Donald A. Waterman, “A Guide to Expert Systems”, Tech knowledge Series in Knowledge Engineering, 1986.

COMS 540: ARTIFICIAL INTELLIGENCE

UNIT I

Introduction : Intelligent Agents – Search Strategies – Solving Problems by Searching – Breadth–First – Depth-First – Depth-Limited – Iterative Deepening – Bidirectional – Informed Search Methods – A* - AO* - Games as Search Problems – Alpha-Beta Pruning.

UNIT II

Representation: Propositional Logic – First – Order Logic –Frame Systems and Semantic Networks.

UNIT III

Reasoning: Inference in First-Order Logic – Forward and Backward Chaining – Resolution – Unification- Logical Reasoning Systems.

UNIT IV

Planning: Simple Planning Agent – From Problem Solving to Planning – Basic Representations for Planning – Practical Planners – Hierarchical Decomposition – Resource Constraints – Uncertainty – Probabilistic Reasoning Systems.

UNIT V

Learning: General Model of Learning Agents – Inductive Learning - Computational Learning Theory – Learning in Neural and Belief Networks – Reinforcement Learning – Types of Communicating Agents – Robotics: Tasks, Parts, Configurations Spaces, Navigation and Motion Planning.

TEXTBOOKS

1. Stuart J.Russell and Peter Norvig, **"**Artificial Intelligence-A modern approach", Tata Mc Graw Hill Publisher – 2nd Edition,2005.

REFERENCES

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata Mc Graw Hill Publisher-2nd Edition.
2. Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India.

COMS 541: FUNDAMENTALS OF AGENT TECHNOLOGY

UNIT I

Introduction – Intelligent Agents – Environments – Intelligent agents – Agents and Objects – Agents and Expert Systems – Agents as Intentional Systems – Abstract Architectures for Intelligent Agents – How to tell an agent what to do – Synthesizing Agents

UNIT II

Deductive Reasoning Agents – Agents as Theorem Provers – Agent-Oriented Programming – Concurrent MetateM

Practical Reasoning Agents – Proactical Reasoning Equals Deliberation Plus Means-Ends Reasoning – Means-Ends Reasoning – Implementing a Practical Reasoning Agent -Homer – The Procedural Reasoning System

Reactive and Hybrid Agents- Brooks and the Subsumption Architecture – The Limitations of Reactive Agents – Hybrid Agents

UNIT III

Multiagent Interactions – Utilities and Preferences – Multiagent Encounters – Dominant Strategies and Nash Equilibria – Competitive and Zero-Sum Interactions – The Prisoner's Dilemma – Other Symmetric 2 x 2 Interactions – Dependence Relations in Multiagent Systems

Reaching Agreements – Mechanism Design – Auctions – Negotiation – Argumentation

Communication – Speech Acts – Agent Communication Languages – Ontologies for Agent Communication – Coordination Languages

UNIT IV

Cooperative Distributed Problem Solving – Task Sharing – Combining Task and Result Sharing – Handling Inconsistency – Coordination – Multiagent planning and Synchronization

UNIT V

Methodologies – Agent-Oriented Analysis and Design Techniques – Pitfalls of Agent Development – Mobile Agents
Applications of Agents

TEXT BOOK

1. Michael Wooldridge, An Introduction to Multiagent Systems, John Wiley & Sons Ltd.2002.

REFERENCES

1. Gerhard Weiss, Multi-agent Systems – A Modern Approach to Distributed Artificial Intelligence, MIT Press,1999
2. Walter Brenner et al, Intelligent Software agents-Foundation and application, Springer Verlag,1998.
3. Nicholas R. Jennings, Michael Wooldridge, Agent Technology: Foundations, Applications and markets, Springer Verlag Publishing.

COMS 542 : ENTERPRISE RESOURCE PLANNING

UNIT I

Integrated Management Information Seamless Integration-Supply Chain Management-Integrated Data Model- Benefits Of ERP-Business Engineering And ERP- Definition Of Business Engineering- Principles of business engineering- Business engineering with information technology.

UNIT II

Building The Business model - ERP implementation – an Overview – Role Of Consultant, Vendors and Users, Customization- Precautions- ERP Post implementation options- ERP Implementation Technology – Guidelines for ERP Implementation.

UNIT III

ERP domain- MPG/PRO – IFS/Avalon- Industrial and financial systems- Baan IV SAP – Market Dynamics and dynamic strategy.

UNIT IV

Description – Multi- client server solution- Open technology- User Interface-Application Integration.

UNIT V

Basic architectural Concepts- The system control interfaces- Services-Presentation interface – Database Interface.

TEXT BOOK

1.Vinod Kumar Garg and N.K.Venkita Krishnan, '*Enterprise Resource Planning-Concepts and Practice',* PHI,2nd edition,2004.

REFERENCES

1.Jose Antonio Fernandz, '*The SAP R/3 Handbook',* Tata McGraw Hill Publications,2006.

COMS 543 : ELEMENTS OF SOFTWARE PROJECT MANAGEMENT

UNIT I

INTRODUCTION: Defining a software development process – process – identify the software model activities, relationship among activities – document information on each activity, tailoring improving the process. Discipline – need for implementing discipline – attributes of successful leader. Communicating in Harmony – Personality traits, management tools.

UNIT II

PROJECT SCHEDULE PLANNING: Top down and bottom up planning – initial and final project schedule plans – types of activity relationships – estimating the duration of an activity – critical path – identifying milestones – activity responsibility matrix – project check list.

UNIT III

PROJECT TRACKING: Overview of project progress – project outlook – occurrence of tracking – tracking meetings – tracking meeting ground rules – recovery plans – the role of escalations.

UNIT IV

PRODUCT REQUIREMENT AND SPECIFICATIONS: Product requirement – understanding the customers problem to solve – product objectives – providing direction for the solution – product specifications – defining the final product – development testing – unit test – function test – function test plan – anticipating qualities weak link.

UNIT V

MARKETING ISSUES:

Vendor relationships – the vendor contract process – defining the vendors work – performance incentives – a trackable plan – measure performance routinely – quality system – proximity to main location – acceptance of deliverables is hipped product – non preferential treatment – selecting , replacing a vendor – legal considerations – subcontractors – post projects review – product certification reviews.

TEXT BOOKS

1. Neal Whitten, *'Managing Software Development Projects , Formula for Success'*, John Wiley and sons , Inc, II edition , 1995.

2.Watts Humphrey, *'Managing the Software Process'*, Addison Wesley, 1989.

COMS 544 : SOFTWARE TESTING AND QUALITY ASSURANCE

UNIT I

SOFTWARE TESTING PRINCIPLES: Need for testing - Psychology of testing - Testing economics - White box, Black box, Grey box testing – SDLC and Testing - Verification & Validation - Weyuker's adequacy axioms.

UNIT II

TESTING STRATEGIES: White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis - Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning - Syntax testing - Finite state testing - Levels of testing - Unit, Integration and System Testing.

UNIT III

TESTING OBJECT ORIENTED SOFTWARE: Challenges - Differences from testing non-OO Software - Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification.

UNIT IV

Introduction to Quality and Quality Control - Evolution of Quality Control - Quality assurance - Quality circles and Quality improvement teams - Benefits of Quality control- Quality and Reliability - Quality costs - Measuring Quality costs - Total Quality Management.

UNIT V

CMM Model and its stages - Introduction to PCMM, CMMI and Six Sigma concepts. ISO 9000, ISO 9000 – Part3 for software Quality.

TEXT BOOKS

1. Roger S. Pressman, " Software Engineering. A Practitioners Approach", Fifth Edition, 2001
2. William E.Perry, *" Effective Methods for Software Testing (2nd Edition) "*, John Wiley & Sons, 2000.
3. Robert V.Binder, *" Testing Object-Oriented Systems: Models Patterns and Tools "*, Addison Wesley, 2000.
4.Rajneesh Kapur, "Getting ISO 9000 in a software organization", By BPB Publications.
5.Allan C Gillies, " Software Quality theory and management", Thompson learning.
6.Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education.
7.Norman E Fenton and Shan Lawrence Pfleeger, "Software Metrics", Thompson learning.
8.Mordechan Ben, Chrissis Mike Konard and Sandy Shrum, CMMI, Pearson Education Ltd.

REFERENCES

1. Glenford J.Myers, *"The Art of Software Testing "*, John Wiley & Sons, 1997.
2. Boris Beizer, Black-Box Testing: *"Techniques for Functional Testing of Software and Systems "*,John Wiley & Sons, 1995.
3. P.C.Jorgensen, *" Software Testing - A Craftman's Approach "*, CRC Press, 1995.

COMS 545 : OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT I

Overview of Object-oriented systems development – Need for object orientation - Overview of the unified approach -Object Basics -Object-Oriented Systems Development Life Cycle – The software development process- building high-quality software- object-oriented systems development- reusability.

UNIT II

Object-Oriented Methodologies – Unified Modeling Language – Static and dynamic models- why modeling- introduction to the unified modeling language- UML diagrams- UML class diagram- Use-case diagram- UML dynamic modeling- model management- UML extensibility- UML meta-model.

UNIT III

Object-Oriented Analysis Process- identifying Use Cases – Use-case driven object-oriented analysis- business process modeling- Use-case model- Object Analysis- Classification – classifications theory- approaches for identifying classes-Identifying object relationships - identifying attributes and methods- defining attributes by analyzing use cases and other UML diagrams.

UNIT IV

The Object-Oriented Design Process and Design Axioms – the object-oriented design process- object-oriented design axioms- corollaries- design patterns.

Designing Classes - the object-oriented design philosophy- UML object constraint language- designing classes- the process- class visibility- designing classes- refining attributes - designing methods and procedures- Access Layer - designing access layer classes- case study -View Layer- Designing interface objects – user interface design as a creative process- designing view layer classes

UNIT V

Case Study - Use-case model- developing effective documentation- Analyzing the ViaNet Bank ATM - Relationship analysis for the ViaNet Bank ATM System- defining attributes for ViaNet Bank objects- object responsibility - defining methods for ViaNet Bank objects - refining attributes for the ViaNet Bank objects - designing methods for the ViaNet Bank objects - Designing the access layer for the ViaNet Bank ATM - designing user interface for the ViaNet Bank ATM.

TEXTBOOK

1. Ali Bahrami, *'Object Oriented Systems Development'*, McGraw Hill Publication-International Edition.

COMS 546: DATA WAREHOUSING AND MINING

UNIT I

Evolution of database technology – Introduction to data warehousing and data mining - Differences between operational databases and data warehouses.

UNIT II

Data warehouse architecture & design, Hardware & Operational design, Tuning and testing.

UNIT III

Data mining: Data preprocessing, data mining primitives, languages & system architectures, concept description: characterization and comparison, Mining association rules, classification and prediction.

UNIT IV

Cluster analysis, Applications and trends in data mining.

UNIT V

Introduction to Microsoft's OLE DB for Data mining, DBMiner.

TEXTBOOKS

1. Sam Anahory and Dennis Murray, "Data Warehousing in the real world", Addison Wesley 1997.
2. Jiawei Han et, al., "Data Mining: Concepts and Techniques", Morgan Kaufmaan series , 2000.

REFERENCES

1. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
2. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
3. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997

COMS 547: INTRODUCTION TO BIOINFORMATICS

UNIT I

Introduction of Bioinformatics : Definition – Challenges in Bioinformatics – Internet and Bioinformatics – Molecular biology's central dogma – DNA, RNA and Proteins – Genes & Genomes – Representation of DNA, RNA and Protein structures – codons& Anticodons- Open reading frames(ORF)- exons & introns- software tools for Bioinformatics

UNIT II

Literature Databases : Public databases and data formats, popular gene and protein databases – Sequence alignment and sequence searching- Database search strategies- querying strategy , similarity searching Vs homology– popular tools for database searching and querying – FETCH, LOOKUP, ENTREZ, NetFETCH, BLAST, FASTA Interpretation of results

UNIT III

Pairwise alignment : Problem Definition & Biological motivation- similarity and differences- global alignment, Local alignment – gap penalty models – substitution matrices – PAM, BLOSUM- Applying dynamic programming to pairwise alignment- Needleman-Wunsch algorithm, Smith_waterman Algorithm

UNIT IV

Multiple Sequence alignment: Computational challenges – Dynamic programming solution – approximation algorithms- center star, distance from concensus, sum of pairs, progressive alignment, multiple alignment to a phylogenetic tree-Tools for Multiple sequence alignment- CLUSTALW

UNIT V

Phylogenetic Analysis : Basic definitions- From MSA to phylogenetics – Phylogentic tree construction methodologies- Distance based methods- UPGMA, Neighbour joining – Character based Methods- Maximum parsimony- Fitch algorithm, weighted parsimony- Sankoff's algorithm, Maximum likelihood, tools for Phylogenetic tree construction PAUP, PHYLIP.

TEXT BOOKS

1. S.Sundararajan, R.Balaji , "Introduction to Bioinformatics", Himalaya Publishing House,2002.
2. Andreas D.Baxevanis, B.F.Oullette, Ouellette, B.F.Francis , "Bioinformatics : A practical guide to the analysis of genes and proteins",2nd edition,2004.
3. David Mount , "Bioinformatics : Sequence & Genome Analysis".
4. Cynthia Gibas, Per Jambeck, Lorrie Lejeune, "Developing Bioinformatics Computer skills"

COMS 548 : INTRODUCTION TO SOFTWARE ARCHITECTURE

UNIT I

Introduction – Software Architecture – Software Design levels – An Engineering Discipline for Software – The status of Software Architecture – Architectural styles – Pipes and filters – Data Abstraction and Object-oriented organization – Event based, implicit invocation – Layered systems – Repositories – Interpreters – Process Control – Other Familiar Architecture – Heterogeneous Architectures.

UNIT II

Case studies - Key word is Context – Instrumentation Software – Mobile Robotics – Cruise Control – Three Vignettes in Mixed Style

UNIT III

Shared Information Systems – Database Integration – Integration in Software Development Environments – Integration in the Design of Buildings – Architectural structures for shared Information Systems

UNIT IV

Guidance for User-Interface Architectures – The quantified Design Space – The value of Architectural formalism – Formalizing the Architecture of a specific system – Formalizing an Architectural Style – Formalizing an Architectural Design Space – Towards a Theory of Software Architecture – Z Notation

UNIT V

Requirements for Architecture – Description Languages – First class connectors – Adding Implicit Invocation to Traditional Programming Languages – Tools for Architectural Design – UniCon – Exploiting Style in Architectural Design Environments – Beyond definition/Use: Architectural Interconnection

TEXT BOOKS

1. Mary Shaw, David Garlan, “Software Architecture – Perspectives on an Emerging Discipline”, Prentice Hall of India, Eastern Economy Edition,1996.
2. 2. Boris Beizer, " Software Testing Techniques (2nd Edition) ", Van Nostrand Reinhold, 1990.

COMS 549: ADVANCED JAVA

UNIT-I

JAVA BASICS REVIEW : Data Structures - Collection classes - Event handling - Multithreading - Byte code Interpretation - Customizing application -Java streaming - Networking.

UNIT-II

DISTRIBUTED COMPUTING: Distributed Computing : Lookup Services - Remote Method Invocation (RMI) - Common Object Request Broker Architecture (CORBA) - JDBC Technology – Servlets.

UNIT-III

JAVA BEANS AND SWING: Bean concepts - Events in bean box - Bean customization - Persistence - Application - deployment using swing - Advanced swing techniques - JAR file handling.

UNIT-IV

JAVA ENTERPRISE APPLICATIONS : JNI - Java Server Pages - Session beans - Entity beans - Programming and deploying enterprise Java Beans - Java transactions – Java Web Services.

UNIT-V

RELATED JAVA TECHNIQUES : Performance Tuning Techniques - Improving Performance by Design - Internationalization - Case study - Deploying n-tier application, E-commerceapplications.

Textbook

1. Calvin Austin and Monica Pawlan, “Advanced Programming for the Java 2 Platform”, 2000**.**
2. Deitel & Deitel , "Java How to program" , Prentice Hall , 7 th Edition, 2007.
3. Gary Cornell and Cay S. Horstmann, " Core Java, Vol. 2: Advanced Features,", Sun Microsystems Press, 2008.
4. Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications", 1998.

COMS 550:NATURAL LANGUAGE PROCESSING

Unit – I

Introduction – Knowledge in Speech and Language Processing – Ambiguity – Models and Algorithms – Language, Thought, and Understanding – The State of the Art and the Near term Future – Some Brief History.

Unit – II

Morphology and Finite-State Transducers – Survey of English Morphology – Inflectional Morphology – Derivational Morphology – Finite-State Morphological Parsing – The Lexicon and Morphotactics – Morphological Parsing with Finite-State Transducers – Orthographic Rules and Finite-State Transducers – Combining FST Lexicon and Rules – Lexicon-Free FSTs: The Porter Stemmer – Human Morphological Processing.

Unit – III

Word Sense Disambiguation and Information Retrieval – Selection Restriction-Based Disambiguation – Limitations of Selectional Restrictions – Robust Word Sense Disambiguation – Machine Learning Approaches – Dictionary-Based Approaches – Information Retrieval – The Vector Space Model – Term Weighting – Term Selection and Creation – Homonymy, Polysemy, and Synonymy – Improving User Queries – Other Information Retrieval tasks.

Unit – IV

Discourse – Reference Resolution – Reference Phenomena – Syntactic and Semantic Constraints on Conference – Preferences in Pronoun Interpretation – An Algorithm for Pronoun Resolution – Text Coherence – The Phenomenon – An Inference Based Resolution Algorithm – Discourse Structure.

Unit – V

Machine Translation – Language Similarities and Differences – The Transfer Metaphor – Syntactic Transformations – Lexical Transfer – The Interlingua Idea: Using Meaning – Direct Translation – Using Statistical Techniques – Quantifying Fluency – Quantifying Faithfulness – Search – Usability and System Development.

Text Book

Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Pearson Education, 2002.

Reference

Bharathi, A., Vineet Chaitanya and Rajeev Sangal. 1995. *Natural Language Processing-A Paninian Perspective*. Prentice Hall India, Eastern Economy Edition.

COMS 551:MICROPROCESSOR ARCHITECTURE

Unit I

Introduction to the Microprocessor : History - Microprocessor-Based Personal Computer System - Number Systems - Computer Data Formats - **Architecture & Addressing :** Microprocessor Architecture - Real Mode Memory Addressing - Protected Mode Memory Addressing - Memory Paging - Addressing modes.

Unit II

8086/8088 : Pin-outs and Pin Functions - Clock Generator (8284A) - Bus Buffering and Latching - Bus Timing - Ready and the Wait State - Minimum Mode Verse Maximum Mode .ALP Instructions : Data Movement – Arithmetic and Logic – Program Control. Assembly language With C/C++ .

Unit III

Memory Interface : Memory Devices - Address Decoding - 8088 and 80188 (8-bit) Memory Interface - Dynamic RAM. Basic I/O Interface : Introduction to I/O Interface - I/O Port Address Decoding - The Programmable Peripheral Interface - The 8279 Programmable Keyboard/Display Interface - 8254 Programmable Interval Timer - Analog-to-Digital (ADC) and Digital-to-Analog (DAC) Conversions

Unit IV

Interrupts : Basic Interrupt Processing - Hardware Interrupts - Expanding the Interrupt Structure - 8259A Programmable Interrupt Controller - Interrupt Examples . Direct Memory Access and DMA-Controlleed I/O : Basic DMA Operation - The 8237 DMA Controller - Shared-Bus Operation - Disk Memory Systems - Video Displays. Bus Interface : The ISA Bus - The Peripheral Component Interconnect (PCI) Bus - The Parallel Printer (LPT1) Interface - The Serial COM Ports - The Universal Serial Bus (USB) - Accelerated Graphics Port (AGP).

Unit V : 80186, 80188, and 80286 - The Pentium and Pentium Pro Microprocessors.

Text Books

1. Barry B. Brey, “The Intel Microprocessors 8086/8088,80186/80188,80286,80386, 80486, Pentium & Pentium Pro processors”, Seventh Edition.

References

Gaonkar, “Microprocessor Architecture, Programming and Applications”, Wiley Eastern Ltd., 1987.

COMS 552:DECISION SUPPORT SYSTEM

UNIT I

Decision making, Systems, Modeling, and support – Introduction and Definition – Systems – Models – Modeling process – Decision making: The intelligence phase – The design phase - The choice phase – Evaluation: The implementation phase –Alternative Decision – Making models – Decision support systems – Decision makers - Case applications.

UNIT II

Decision Support System Development: Introduction - Life cycle – Methodologies – prototype – Technology Levels and Tools – Development platforms – Tool selection – Developing DSS Enterprise systems: Concepts and Definition – Evolution of information systems – Information needs – Characteristics and capabilities – Comparing and Integrating EIS and DSS – EIS data access, Data warehouse , OLAP, Multidimensional analysis, Presentation and the web – Including soft information enterprise on systems - Organizational DSS – supply and value chains and decision support – supply chain problems and solutions – computerized systems MRP, ERP, SCM – frontline decision support systems.

UNIT III

Introduction – Organizational learning and memory – Knowledge management – Development –methods, Technologies, and Tools – success –Knowledge management and Artificial intelligence – Electronic document management.

Knowledge acquisition and validation: Knowledge engineering – Scope – Acquisition methods - Interviews – Tracking methods – Observation and other methods – Grid analysis

UNIT IV

Inference Techniques: Reasoning in artificial intelligence – Inference with rules: The Inference tree – Inference with frames – Model-based and case-based reasoning - Explanation and Meta knowledge – Inference with uncertainty – Representing uncertainty – Probabilities and related approaches – Theory of certainty – Approximate reasoning using

UNIT V

Implementing and integrating management support systems – Implementation: The major issues - Strategies – System integration – Generic models MSS, DSS, ES – Integrating EIS, DSS and ES, and global integration – Intelligent DSS – Intelligent modeling and model management – Examples of integrated systems – Problems and issues in integration.

TEXT BOOK

Efrain Turban, Jay E.Aronson, “Decision Support Systems and Intelligent Systems” 6th Edition, Pearson Education, 2001.

COMS 553:SOFT COMPUTING

Unit I

ARTIFICIAL NEURALS : Basic-concepts-single layer perception-Multi layer perception-Supervised and un-supervised learning back propagation networks, Application

Unit II

FUZZY SYSTEMS: Fuzzy sets and Fuzzy reasoning-Fuzzy matrices-Fuzzy functions-decomposition-Fuzzy automata and languages- Fuzzy control methods-Fuzzy decision making, Applications

Unit III

NEURO-FUZZY MODELLING: Adaptive networks based Fuzzy interfaces-Classification and Representation trees-Data dustemp algorithm –Rule base structure identification-Neuro-Fuzzy controls

Unit IV

GENETIC ALGORITHM: Survival of the fittest-pictures computations-cross over, mutation-reproduction-rank method-rank space method, Application

Unit V

SOFT COMPUTING AND CONVENTIONAL AI: AI Search algorithm-Predicate calculus- rules of interface - Semantic networks-frames-objects-Hybrid models applications

References*:*

1.Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998

2. Timothy J.Ross:Fuzzy Logic Engineering Applications.McGraw Hill,NewYork,1997.

3. Laurene Fauseett:Fundamentals of Neural Networks.prentice Hall India,New Delhi,1994.

4. George J.Klir and Bo Yuan,Fuzzy Sets and Fuzzy Logic,Prentice Hall Inc.,New Jersey,1995

5. Nih.J.Ndssen Artificial Intelligence,Harcourt Asia Ltd.,Singapore,1998.

COMS 554:PRINCIPLES OF DISTRIBUTED SYSTEM

UNIT I

Definition-Goals-Hardware and Software Concepts – Client/Server Model Communication - Layered Protocols – RPC-Remote Object Invocation – Message Oriented Communication

UNIT II

Threads – Client –Server – Code Migration –S/W Agents Naming Entity – Location Mobile Entity

UNIT III

Synchronization- Clock Synchronization-Logical Clocks- Global States-Election Algorithms- Mutual Exclusion – Distributed Transaction Consistence and Replication - Introduction- Data Centric Consistence- Fault Tolerance- Reliable Client/Server Communication- Distributed Commit – Recovery

UNIT IV

Distributed Object Database System CORBA – DCOM - GLOBE.

UNIT V

Distributed File System- Distributed Document Base System-WWW-Distributed Co-ordination Base System- JINI

Text Books

1. Andrew S.Tanenbaum, Maarten van Steer "Distributed Systems – Principles and Paradigms", 2002, Prentice Hall India.

rEFERENCE

1.George Couloursis, Jean Dollomore and Tim Kinderberg, " Distributed Systems : Concepts and Design", Addison Wesley.