

MASTER OF COMPUTER APPLICATIONS (M.C.A.)

M.C.A. – I (First Year)

Semester – I

101. Elementary Algorithmics

This is a foundation paper for almost all other papers. Problem analysis, algorithms design and algorithm representation techniques will be studied. About 30 problems will be analyzed and algorithms will be developed. Concepts of algorithm efficiency will be introduced. Emphasis will be given to Pseudo codes, flowcharts and tracing of algorithms. Student should be able to identify and use sequential, selection and iteration structures with ease.

1. Concepts of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo Code and Flow-Charts. Tracing of Algorithms. Concepts of a program and structure of procedure oriented languages.
2. Problem Analysis and Design of Algorithms for problems such as (1) Swapping (2) Counting (3) Finding the Sum, Product, maximum, minimum of a finite list of numbers, and (4) Simple variations of the above problem realization that, there may be alternative algorithm and that one algorithm may be better (in some sense) than the other.
3. Problem Analysis Design of Algorithms for problems such as (1) Evaluation of a polynomial (2) Sum of first n factorials (3) Finding the n^{th} term of a Fibonacci sequence, (4) Finding the largest and second largest of a finite list, (5) Evaluating in finite series and variations of these problems, (6) Determining n^{th} root of a number.
4. Introduction to recursive algorithms and their tracing. Applications to: (1) Computation of a factorial, sum, Fibonacci terms etc. (2) Base conversion (3) Reversing a string and checking for palindrome property. (4) To compute GCD. Efficient algorithms for power function evaluation, Fibonacci terms.
5. Concept of array and problems that involve array manipulation (1) Removing the duplicates (2) Partitioning of an array, (3) Listing of prime numbers, (4) Finding the prime factor of a numbers (5) Printing a Histogram.
6. The problem of search and merge, Linear search, Binary search and Hash search algorithm. The problem of Sorting: Selection, Insertion, Bubble, Quick and Merge Sort algorithms.
7. Program performance, space complexity, time complexity, asymptotic notation. Practical complexities, performance measurements. Illustration with simple examples.

Text books:

1. Dromey R. G.: How to Solve it by a Computer.
2. Sartaj Sahni: Data Structures, Algorithms and Applications in C++ (Ch II).

102. Computer Organization and Architecture

1. **Digital logic Circuit and Digital Components:** - Digital Computers, Logic gates Boolean algebra, Rules Simplifications, Combinational Circuits, Flip-flops and sequential circuits. Integrated circuits, decoders, multiplexes, registers, shift registers, binary counters and memory units.
2. **Data Representation:** - Data types, complements, base conversion algorithms, fixed point and floating point representation, subtraction, multiplication algorithms, Division algorithms, floating point arithmetic operations, decimal arithmetic units, decimal arithmetic operations.

3. Register transfer and micro processions, instruction codes, computer registers, computer information, instruction cycle, memory reference instruction, I/O instructions and interrupts. Design of basic computers. Programming with 8085, simple 8086 programs.
4. **Microprogrammed control:** - Control memory, address reducing, microprogramming examples, design of control unit, CPU-control register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, CICS and RISC characteristics.
5. **Input/Output organization:** - Peripheral devices, Input Output interface, Asynchronous data transfer, nodes of data transfer, Priority interrupt, DMA, IOP, Serial communication. Memory Organization – Hierarchy, Virtual memory, Associative and cache memories, memory management hardware.

Textbook:

1. Computer System Architecture: M. Morris Mano, PHI (1993).

Reference books:

1. Computer Organization and Design: Pal Choudary P, PHI (1994).
2. Introduction to Digital Computer Design: Raja Raman V. and Radhakrishnan T, PHI (1997)
3. Computer Organization and Architecture: Stallings, W., PHI.

103. Procedure Oriented Programming

This is a first course on Computer Language. Emphasis is on the basic 8 constructs that appear in any procedure oriented language. Implementing the algorithms in C language is the goal. Good style, emphasis on semantics is the important criteria in writing programs. The C language will be covered exhaustively, with emphasis on using functions and files.

1. **Concepts of problem, problem analysis, algorithm, algorithm representation:** - Pseudo code & flowchart, tracing an algorithm, program, computer languages, language hierarchies, interpreters and compilers, programming, programming stages – analysis, algorithm design, generation of test data, coding, testing, debugging and documentation down approach to algorithm design, identification of sequential, selection and iteration structures.
2. **Concepts of procedure oriented languages:** - Character set, reserved and user defined words, statements and statement types – executables statements, input statements, assignment and arithmetic statements. Transfer of control statements – implicit and explicit transfers, output statements. Declarative statements – comments, data types and type declarations. Simple and compound statements. Subprograms – functions and procedures, arguments to subprograms and return values. Libraries.
3. **Procedural elements in ‘C’:** - Character set, reserved words, data types, constants and variables, comments and type declarations, structure of a ‘C’ program – header files and include command, main function, simple and compound statements, block of statements, assignment statement, arithmetic statements – arithmetic operators, arithmetic expression, precedence and associative properties, simple selection structure – relational operators, relational expressions, Logical operators, logical expressions, if, if...else, if... else if... statements, conditional operator – switch... case statement. Iteration structures – for, while, do...while statements, continue and break statements, nested loops. Unconditional Branching – labels and go to statement.
4. **Derived data types:** - Pointers, dynamic memory management, arrays – one two and higher dimensions, dynamic arrays, character arrays and operations on strings, user defined data types – structures, arrow and dot operations, arrays of structures, structures with array components, nested structures, recursive structures, unions and enumerated data types.
5. **User defined functions, function prototypes, function definition, and function call.** Argument types, return types, function type and function signature, void return type, variable scope and storage classes. Functions with pointer arguments, arrays as arguments, structure as arguments, pointer to function as arguments, recursive functions, variable number of arguments and command line arguments.

6. **Files:** - Internal and external, file maintenance sequential, index sequential and random files. Pre-processor commands, define and macros. Use of const. Keyword. Use of string and math libraries. Differences between procedural elements of C++ and ANSI C, exception handling, dynamic memory management, procedure oriented programming with C++.

Textbook:

1. Let us C by Yashwant Kanetkar.
2. C Programming by E. Balaguruswami.

Reference books:

1. Programming in C by S. Kochan.
2. Born to code in C by H. Schildt.
3. The Art of C by H. Schildt.
4. C Programming by Kerningham and Ritchie – 2nd ed.

104. Introduction to Management Functions

This is a first paper in a series of four compulsory and two elective papers on Business Management. In these papers, the domain specific knowledge from which most of the Computer applications arise will be imparted. Particulars, this paper is an overview of all functional areas of management namely, HRD, Marketing, Finance, Manufacturing, and Strategy. Some of these topics will be taught elaborately in subsequent papers.

1. **HRD:** Selection, Appraisal, Training and Information Systems.
2. **Marketing:** - Understand the concept of marketing mix. These marketing mix elements consist of product policy and design, pricing, choice of marketing intermediaries, methods of physical distribution, use of personal selling, and advertising and sales promotion, marketing research and marketing organization.
3. **Finance:** - Finance function (concept, scope and its relationship with other functions): tools of financial analysis (funds and cash flow analysis, ratio, analysis, risk-return trade-of): financial forecasting (Performa income statement and balance sheet, cash flow forecasting under uncertainty, financial planning): estimation and management of working capital (operating cycle concept, inventory, accounts receivables, cash and accounts payables, working capital requirements).
4. **Manufacturing:** - Operations Planning and Control (aggregate planning, multiple product batch, production cycles, short term scheduling of job shop, setting production rate in continuous production systems, activity scheduling in projects, introduction to project time calculations through PERT/CPM): Management of Supply Chain, Materials Management (introduction to materials management, systems and procedures for inventory management planning, and procurement of materials): quality management (quality concept and planning, standardization, quality circles).
5. **Strategy:** - Firm and its Environment: strategies and resources; industry structure and analysis: evaluation of corporate strategy; strategies for growth and diversification; process of strategic planning.

Reference book:

1. Agarwal, R. D.: “Organization and Management”, Tata McGraw Hill, 1986.
2. Massie: “Essentials of Management”, 4th ed. Prentice Hall of India, 1996.

105. Mathematical Foundations

The purpose of this paper is to teach mathematical concepts necessary to understand other topics. The topics covered include sets, relations and functions, their computer representations and manipulation, Mathematical logic and Graph Theory. About half the paper covers all aspects of graph theory, graph

representation and graph algorithms. Elementary concepts of differentiation and Integration will also be reviewed.

1. **Mathematical Logic:** - Statements and connections, normal forms, reduction to normal forms, Inference theory of statement and predicate calculus, Automatic theorem proving.
2. **Set Theory:** - Basic concepts sets, representation and manipulation of finite sets in computer. Induction and recursion, application to algorithm verification, application to regular languages.
3. **Relations and functions:** - Product sets and relations, properties of relations, equivalence relations and partitions, classes properties, matrix and diagram representation of relations. Function one-to-one, onto, inverse function, permutation differentiation and integration of a function. Algorithm for manipulation of function and relations.
4. **Graph Theory:** - Graph terminology and graph representations, Elementary graph algorithm, Directed graph-topological sorting algorithm, Warshal algorithm, graph coloring.
5. **Binary trees:** - Sequential and linked list representation of trees, tree traversal algorithm, Binary search tree and heaps, insertion and deletion algorithm into binary trees, 2-trees, application to Huffman codes.

Text book: -

1. Kolman B. and Busby R.: “Discrete Mathematical Structures for Computer Science”. PHT (UNITS 2 & 3).

Reference books: -

1. Kolman B. and Busby R.: “Discrete Mathematical Structures for Computer Science”. Prentice Hall, 1987.
2. Sahni S., “Concepts in Discrete Mathematics”, Camelot Publisher, USA, 1981.
3. Tremblay, J. P., et al., “Discrete Mathematical Structures with Applications to Computer Science”, McGraw Hill, 1987.

106. Information Technology Laboratory

In this paper components, their functions, and interactions of a task performing system are studied; Data representation and algorithms for base conversions and arithmetic operations are covered; Elementary digital electronics, addressing modes and assembly language constructs are introduced; Elementary concepts of software types, operating system concepts, Communication networks and Internet are also covered. Finally history and evolution of Computers, characteristics and functioning of Input Output devices are left to be covered through assignments.

1. Computer definition, uses, block diagram, functions of ALU, input/output, scanner, plotter, keyboard, mouse, MICR, Bar decoder, OCR, joystick, monitor, printer, memory unit and CPU.
2. Software-types, compilers, interpreter, assembler, linker, loader, high-level and low-level languages. Files-types and operations, indexed, sequential, and hashed organization, sorting, merging, indexing and updating functions, concept of a file allocation table.
3. Operating System-types-timesharing, batch processing, multiprogramming, real-time; functions of operating systems-Introduction to file management, detailed study of DOS and Windows.
4. Networking – Data communication concepts, classifications, communication media, LAN, WAN, MAN, Internet, Intranet, Extranet, Topology, protocols, Communication process, media access methods, OSI Layers, Browsers and their efficient use.
5. Study of Office 2000 (MS-word, MS-Power point, MS-Excel)
- 6.

107. Minor Software Project

A Minor Software Project is little more than a practical assignment. The Project work should be completed in about 25 terminal hours. Emphasis is on Problem Analysis, problem decomposition, function prototyping, filed I/O, flow charting, good user interface, preparing the user manual and

good presentation of the work as a report. It is important to complete the project with quality. This project can be done only in 'C' environment.

Semester – II

201. Data Structures and Algorithms

This is another foundational paper that complements the paper on Elementary Algorithms. A program has two components the first one is data structure and the second one is algorithm. In this paper, Data Structures are covered in depth. The distinction between data structure, storage structure, implementation in a language are clearly studied in this paper. The arrays, linked lists, stacks, queues, binary trees, trees with possible variations and their applications are taught; Algorithm complexity with reference to searching and sorting are introduced.

1. Concept of Data type. Data object. Data Structure and Representation, Abstract Data Structures, Introduction To Analysis of Data Structure and Algorithm.
2. Arrays as ADT, Implementation of arrays, Single Dimensional and Multidimensional.
3. Stack as ADT, Implementation of Stack, Push and Pop Operations, Conversion of Infix to Postfix Notation, Evaluation of Postfix Notation, Recursion Using Stacks (Concept only).
4. Queues As ADT, Implementation of Queues, Application of Queues to Pre-Emptive Scheduling in Transaction Processing, Circular Queues Using Arrays.
5. Linked List as ADT, Singly Linked List, Operations on Linked List, Implementations of Stacks and Queues Using Linked Lists, Doubly Linked Lists, Application of Double Linked Lists in Dynamic Management, Concept of Generalized Link List.
6. Trees as ADT, Basic Terminology, Binary Tree Traversal-In order, Post order, Preorder (both recursive and non-recursive versions). Threaded Binary Trees, Traversal of Thread-ed Binary Trees, Binary Tree Representation of Trees.
7. Symbol Table: Concept of Table, Static Tree Table, Binary Search, Tree Definition and Search Algorithms, Huffman Algorithm, Dynamic Tree Table as Binary Search Tree, Concept of Height-Balance (AVL) Trees, Introduction to Rebalancing Techniques (Concept only), Insertion and Deletion of Node in Dynamic Binary Search Tree, Hash Table, Hashing Techniques.
8. Searching: Linear Search, Binary Search, Depth First Search and Breadth First Search on Binary Trees.
9. Sorting: Bubble Sort, Insertion Sort, Quick Sort, and Heap Sort.

Textbooks:

1. Data structure Using 'C', by Tanenbaum.
2. Data Structure, by Seymore Lipschutz.

Reference books:

1. Fundamentals of Data Structure in Pascal- by Horowitz, Sahani.
2. Introduction to Data Structure an Application- by Trambley Scrioson.
3. Data Structure an Advance Approach Using 'C' – by Esakv, Weises.
4. Data Structure and Program Design- by Robert L. Kruse.

202. Operating Systems

Operating System concepts are closely associated with architecture. Hence, in this paper both would be covered together alternating between architecture and operating system concepts. Architectural concepts related to control unit, memories, I/O devices will be covered. Also operating system concepts such as

processes and process management, memory management, Inter process communication, File systems, I/O management will be covered.

1. **Introduction:** - Evolution of operating systems. Types of operating systems. Different views of the operating system, operation system concepts and structure.
2. **Process:** - The process concept, systems programmer's view of processes. The operating system services for process management. Scheduling algorithms. Performance evaluation.
3. **Memory Management:** - Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modeling-paging algorithms, design issues for paging systems, segmentation.
4. **Inter-process Communication and Synchronization:-** The need for inter-process synchronization, mutual exclusion, semaphores, hardware sport for mutual exclusion, queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors, messages, deadlocks.
5. **File Systems:** - File systems, directories, file system implementation, security protection mechanisms.
6. **Input/Output:** - Principles of I/O Hardware: I/O devices, device controllers, direct memory access; Principles of I/O Software; Goals, interrupt handlers, device drivers, device independent I/O software. User space I/O software; Disks: Disk hardware, scheduling algorithms, Error handling, track-at-a-time caching, RAM Disks; Clocks: Clock hardware, memory mapped terminals, I/O software; Terminals: Terminal Hardware, memory mapped terminals, I/O software; Process and Processors in Distributed Systems: Threads, system models, processor allocation, scheduling; Distributed File Systems: Design, implementation, trends.
7. **Performance Measurement, Monitoring and Evaluation:** - Introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.

Textbooks:

Peterson J. L., Abraham Silberschatz: "Operating System Concepts", Addison Wesley Publishing Company, 1989.

Reference book:

1. Deitel, H. M.: "An Introduction to Operating Systems", Addison Wesley Publishing Company, 1984.
2. Milenkovic M.: "Operating Systems – Concepts and Design", McGraw International Edition, Computer Science Series, 1992.
3. Tanenbaum, A. S.: "Modern Operating Systems", Prentice Hall of India Pvt. Ltd, 1995.

203. Database Management Theory

In this paper file structures are taught Database Management theory – design principles, relational Algebra, relational calculus, normalization, demoralization transaction processing, concurrency control, and other topics are covered in depth. Structured Query Language (SQL) is introduced. Database design and implementation is illustrated with MS-Access.

1. **Introduction:** - Basic concepts, advantages of DBMS over file processing system, role of DBMS, database architecture and data independence, data base users, database abstraction schemas and instances, database languages and interfaces, life cycle of DBMS applications, database models.
2. **Data Modeling Techniques:** - Basic concepts, type of data models, introduction E-R diagram, hierarchical, networking and relational database model and their relative advantages and disadvantages, products, comparisons Relational Database Introduction; Codd's 12 Rules; Concept of Domain Tuple, cardinality; comparison between HDB-NDB-RDB.

3. **Normalization:** - Advantages and disadvantages of Normalization, functional dependencies and normalization of relational database, normalization form on primary keys, INF-2NF-3NF-BCNF rules with examples, loss less join and dependency preserving decomposition.
4. **Concurrency Control:** - Problems of concurrent Transactions: Control Mechanism such as Locks, Time-stamps, Optimistic, Scheduling and MVT, Generality.
5. **Recovery Mechanism:** - Recovery from various problems of volatiles and non-volatiles storage devices: Concept-properties-states of Transaction, Introduction to mechanisms such as-Log, Checkpoint and Shadow Paging.
6. **Relational data model and Relational Algebra:** - Relational Model Concepts, Constraints SQL commands- Create/Drop a Database, Creation of Tables, Modify a Table, Alter a Table, Drop a Table, Create/Drop an Index, Data Manipulation Commands, Insert, Update, Delete, Select, Aggregate Functions, Max, Min, Avg, Count, Sum, Other Clauses-Group By, Order By, Having, Union, Predicates, Comparison-Like, Between-Null, In-Exits, Sub-queries Views, Joins.
7. **Distributed Database:** - Concepts, Database Distributions Techniques.
8. **Concepts Object Oriented Database Management Systems.**
9. **Security and Privacy.**
10. **Knowledge database systems, integration of expert systems in database.**

Textbooks: -

1. Database System Concept by Korth.
2. Database Management Systems by Nawathe.

Reference books: -

1. Principals of Database Management by James Martin.
2. Computer Database Organizations by James Martin.
3. Relational Database Design for Micro Computers Application – Prentice Hall – Jackson.

204. Accounting and Management Control

In this paper, Basic Accounting, basic concepts, concepts of Management control systems will be covered.

1. **Basic Accounting** and conventions underlying preparation of Financial Statements (Balance Sheet highlighting accounting equation, profit and loss statement; accounting process; basic accounts, trial balance and financial statements; issues such as provisions for bad debts tax, dividends, losses such as bad debts, missing information, classification effect, cost of assets, rentals etc.); Income Measurement (revenue; recognition and matching costs and revenues; inventory valuation); Depreciation Accounting; Intangible Assets Accounting; Understanding published annual accounts including funds flow statement.
2. **Basic Cost Concepts:** - (introduction; cost classification; allocation, appointment and absorption: cost centers); Cost Analysis for Managerial Decisions (direct costing, break-even analysis; relevant costs; pricing; pricing-joint costs; make or buy; relevant fixed costs and sunk costs) Cost Analysis for Control (standard costing; variances; material, labour, overhead, sales and profit); Standard Cost Accounting (budgeting and control; elements of budgeting; control of manufacturing and manufacturing expenses; performances appraisal, evaluation of cost control systems).
3. **Introduction to Management Control Systems:** - Goals, Strategies, and Key Variables; Performance Measures; Responsibility Centres and Transfer Price; Investment Centres; Reporting Systems; Management by Objectives; Budgeting and Control; Organizational Relationships in Control; Control Dynamics; Management and Control; Strategic and Long-Range Planning; Control of Service Organizations; Control of Projects; Control of Non-Profit Organizations; Control of Multinational Companies.

Reference books: -

1. Bhattacharya S. K. and Deardem John, “Accounting for Management”, Prentice Hall of India, New Delhi.

2. Chadwick, "The Essence of Financial Accounting", Prentice Hall of India Pvt. Ltd., New Delhi.
3. Horngren, Sundem and Selto (9th ed.), "Introduction to Management Accounting", Prentice Hall of India Pvt. Ltd.
4. Welch, Hilton and Gordon (5th ed.), "Budgeting: Profit Planning and Control", Prentice Hall of India Pvt. Ltd., New Delhi.

205. Probability and Combinatorics

In this paper probability theory essential for further applications in Computer science is covered. Also statistics and elementary numerical methods will be taught.

1. **Combinatorics:** - Sum Rule, Product Rule and generalizations, permutations and combinations, algorithm to enumerate permutation, derangements, inverse of permutation, composition of permutations, Pigeonhole principles, Generalized Permutations and Combinations, Binomial and multinomial theorems, sequence and selections, the inclusion and exclusion principle. Application of the above concepts.
2. **Generating function and Recurrence Relation:** - Ordinary and exponential generating functions, Partitions of positive integers, Recurrence relations, Algebraic solutions of linear recurrence relation with constant coefficients, Solution of recurrence relations using generating functions.
3. **Introduction to probability:** - Random Experiment, Sample Spaces and classification of sample spaces. Axiomatic definition of probability and consequences of the axioms, mathematical (Classical) definition of probability, Empirical (Relative frequency, Statistical) Definition of a Probability, concept of subjective probability. Conditional Probability Multiplication rule, Total Probability Theorem, Bayes Theorem and Independence of events. Algorithms to conduct random experiments and to determine empirical probabilities.
4. **Random Variables:** - Definition, classification. Distribution function, Probability density function, Expectation and variance. Definition and properties of Standard Discrete and continuous distributions-Bernoulli, Binomial, Hyper Geometric, Discrete Uniform, Geometric, Negative Binomial, Poisson, Uniform, Beta, Exponential, Erlong, and Normal Probability generating function of discrete distributions.
5. **Simulation:** - Generation of Pseudo Random Numbers and Generation of random variates from standard distributions given in Unit-3 above. Simple Application of Simulation.

Textbook: -

Theory and Problems of Combinatorics: V. K. Balakrishnan (Schaum Outline Series), Chapter 1, 2 McGraw Hill Publications.

206. Windows Programming Laboratory

This is a Practical oriented paper. After a brief introduction to Windows operating system, concepts of Windows Programming are introduced. The Visual Basic Environment is taught in depth.

1. **Introduction to Visual Basic:** - Event Driven Programming, Starting and Existing VB, Understand VB Environment, Project Explorer, Properties Window, Toolbox, Form Layout Window, Property Pages, Getting Help, Saving Project, Printing Projects, Running Applications.
2. **Adding Code and Events:** - Code Window, Naming Conventions, Variables (all data types): Byte, Boolean, Integer, Long (long integer), Single (single-precision floating-point), Double (double-precision floating-point), Currency (scaled integer), Decimal, Date, Object, String (variable-length), String (fixed-length), Variant (with numbers, Variant (with characters), User-defined (using Type), Scope (Global, Local, Static), Constants.

3. **Visual Basic Controls:** - Label and Textbox Controls, Command Button Control, Frame, Checkbox and Option Button Controls, List box and Combo Box Controls, Drive List Box, Directory List Box and File Box Controls, Formatting Controls, Control Arrays, Tab Order.
4. **Working with Functions:** String Functions, Mathematical Functions, Date Functions, Data type conversion Functions.
5. **Control Statements:** - IF and IIF Statements, Select Case Statement, Do Statement, For Statement, Exit Statement.
6. **Dialog Boxes:** - MsgBox, Input box, Common Dialog Box (Microsoft Common Dialog Control 6.0)
7. **Menus:** - Creating Menus, Adding Code to Menus, Toolbars, Other Common Controls (Microsoft Windows Common Controls 6.0, Microsoft Windows Common Controls-3 6.0)
8. **Accessing Data:** - Reading and Writing Files, Data Form Wizard, Data Control, Data Grid Control, DB-Combo Box and DB-List Box, SQL Queries in VB, Jet DAO, ADO (with control and code), Error Handling.
9. **Objects and Classes:** - OLE Control, Programming with Objects (Creating objects of a user defined class and using them on the form).
10. **Active-X Controls:** - Creating your own Active-X control, Adding Active-X controls to a Project.
11. **Windows API:** - Defining Windows API, DLLs, Declare statement, Calling API routine,
12. **COM and DCOM:** - Basic Concepts.
13. **Data / Crystal Reports.**
14. Introductions to VB Script to develop web page and discuss Internet development Features through Visual Basic.

Textbook:

Peter Norton's Guide to Visual Basic 6.0 by Peter Norton.

Reference books:

1. Visual Basic 6.0 Programming by Hotzner Steven.
2. Visual Basic 6.0 in 21 days by Perpy Greg.
3. Visual Basic 6.0 by Peter Wright.

207. Minor Software Project – II

For this paper the student develops a software package using Visual Basic. The emphasis is on Database Design, representation of the design through Data flow diagram and context diagrams, implementation in MS-Access and using VB as front end. The student is expected to spend about 25 terminal hours. Project will be done in groups of not more than 4 students each. Preparing quality report with user manual is important.

M.C.A. – II (Second Year)

Semester – III

301. Software Engineering

This is first of a series of 3 papers on this topic the second two being Unified Modeling Language and Design Patterns (Paper 401) and Software Project Management (Paper 501). In this Paper Software Development life cycle models are introduced in depth. The tools and techniques for various stages of

life cycle are covered thoroughly. This paper covers all topics in Software Engineering for Procedure Oriented approach.

1. **Software Life Cycle:** - Models: Waterfall model, Spiral Model, Prototyping Forth generation techniques. S/W losses. Software requirements specifications (SRS), Fact finding Techniques, Characteristics of the good SRS: Unambiguous, Complete Variable, Consistent, Modifiable, Traceable and usable during the operation and Maintenance phase, Prototype outline for SRS.
2. **S/W Inspection:** - Communication Skills for the System Analyst. Revive/ Inspection Procedure. Document Composition of the inspection team, check list, reading by the inspector, recording of the defects and action recommended. Students should practice inspecting small requirement specification for good characteristics.
3. **System Analysis SA tools and Techniques:** - DFDs, Entity Relationship Diagram's, Project Dictionary.
4. **S/W Design System Design** tools and techniques, Prototyping, Structured Programming.
5. **User Interface Design:** - Elements of good design, Design issues, Features of a modern GUI, Menus, Scrolling, windows, icons, panels, error messages etc.
6. **User Manual:** - User Profile, Contents of an User Manual, Student is urged to install and use a software using its user manual and report the strength and weakness of that user manual. Codes designing for field values and Designing Code-Less system.
7. **Software Configuration Management:** - Base Line, SCM Process, Version Control, Change Management.
8. **Computer Aided Software Engineering:** - CASE, Tools for Project Management Support, Analysis and Design, Programming, Prototyping, maintenance, future of CASE.

Reference books:

1. Software Testing Techniques by Beizer.
2. An Integrated Approach to Software Engineering by Jalote, P.
3. Software Engineering – A Practioner's Approach by Roger S. Pressman.
4. System Analysis and Design Methods by Whitten, Bentley & Barlow.

302. Computer Communications Networks

Some basic concepts of communication Networks are introduced earlier in this paper, Network types, Network components, Network Protocols, Network types, Network Architecture, Interconnecting networks, Concepts of Intranet and Extranet will be taught in depth. Decision of optimal networks will be introduced.

1. **Network Components:** - Types of Servers, Types of workstations, types of network interface card, media for network communication. Wide area and local networks, connections oriented and connectionless networks. Classification of communications protocols, time division multiple access (TDMA), time division multiplexing (TDM), carrier sense (collision) systems, token passing, peer-to-peer priority slot, carrier sense (collision free) systems, token passing (priority) systems.
2. **Network Protocols: Hardware** Protocols, software protocols, OSI Model layers function and application in protocol, Protocols for servers and workstations (SPX/TCP/IP, NETBUI, NWLINK, NETBIOS, RIP), Protocol suite TCP/IP.
3. **Network Types:** - Peer-to-peer network- implementation of Peer-to-peer network using WIN 98, Client Server Network – Topologies for Client Server Network, Switching and Routing Networks- Message switching, packet switching when and when not to use packet switching, packet routing, packet switching support to circuit switching networks.X.25 Network and Supporting Protocols: Features of X.25 layers of X.25 and the physical layers, X.25 and the data link layer, companion standards to X.25, features of X.25 logical channel states, packet formats, internetworking, connectionless mode networks, the frame relay and X.25 stacks. TCP/IP and inter Networking – Example of TCP/IP operations, related protocols ports and sockets, the IP address structure, major features of IP, IP source routing, value of the transport layer, TCP, major features of TCP, passive

and active operation, the transmission control block (TCB), route discovery protocols, examples of route discovery protocols, application layers protocols.

4. **Network Architecture:** - Polling/Selection Protocols- character and bit protocols, binary synchronous control (BSC), HDLC, HDLC options, HDLC frame format, code transparency and synchronization, HDLC transmission process. HDLC subset, SDLC, Protocols conversion. Ethernet (Ethernet Standards, Frame Formats and Specifications), Token Ring and SNA Standards, Frame Formats and cabling).
5. **Connecting Network:** - Components for connective – Switches Hubs, Routers, Bridge, Multiplexers, Concentrators etc. Structured Cabling – Components required in Structured Cabling, Site Preparations for Structured Cabling, Cable Laying Methods, Information Outlets, Patch Cords, Setting up Network Cards and Configuration, Segmentation, Cascading Switches and Hubs.
6. **Dial-up Network:** - Model (Type, Speed, Features), Setting Modem and Modem Properties. Setting a Dial-up connectivity.
7. **Interconnecting Networks:** - Pre-requisites for Inter connecting Networks Devices and Methods user in Inter-Connecting Networks, Inter-linking Networks of Different Server Operating Systems (NT/WIN to NOVELL, LINUX, UNIX and Vice Versa).
8. **Network Installation:** - Installation of File Server, Print Server using, WIN 2000. Novell 5.0 and LINUX. Installation of Client or Workstation using WIN-98.

Textbook:

Computer Networks – U. Black.

Reference books:

1. Essentials of Networking- Microsoft Press.
2. Electronic Version of Documentation of WIN 2000 and NOVELL 5.0
3. Documentation of LINUX Installation (Electronic Version).
4. Study Guide for CNE- Novell Press.
5. Computer Communication Network- Stallings, W.
6. Computer Networks- Tannenbaum A. S.

303. Object Oriented Programming

In this paper first object based programming concepts involving encapsulation and data hiding will be covered. This part also includes topics such as function and operator overloading, templates, exception handling. As a second step. Object oriented programming concepts such as Inheritance, polymorphism, file I/O will be introduced. The implementation of these concepts in C++ and Java will be covered in depths. This paper also covers Thread Programming in Java.

1. **Programming paradigm:** - Monolithic programming procedure oriented programming-decomposition of a solution into subroutines, parameter passing, return values, local variables, modular programming-grouping of procedures based on data, encapsulation, independent compilation, object base programming-data hiding, member functions, operator overloading, exception handling. Object oriented programming-inheritance, interfaces, and polymorphism.
2. **Procedural elements of C++ & JAVA:** - Review of basic constructs, functions with default parameters, function overloading, inline functions, cin and count, manipulators, dynamic memory management, exception handling. Object based constructs in C++ - class, object, access specifiers, member functions, friend functions, operator functions, constructors & destructors, static & constant member functions, function objects, smart pointers, array of objects. Similar constructs in JAVA.
3. **Inheritance and polymorphism in C++ & JAVA:** - Simple multiple & multi level inheritance, various types of inheritance, function overriding, virtual function, pure virtual function, abstract classes. Similar constructs in JAVA.

4. **JAVA packages:** - Importing packages, JAVA Lang – string, string buffer, system, math, wrappers. JAVA. Util – random, date, vector, hash table. JAVA event programming – AWT components (windows, frame, panel, dialog, file dialog, label, button, list, checkbox, text components, choice, menu components), layout managers, event model, listeners/adapters, JAVA applets, JAVA swing – J applet, icons & labels, text fields, button, combo boxes, tabbed and scroll panes, trees, tables, JAVA threads, JAVA doc.
5. **File I/O in C++ & JAVA:** - Understanding stream class hierarchy, sequential & random file management, JAVA I/O – JAVA I/O package, byte/character streams, buffered reader/writer, file reader/writer, print writer, files – sequential/random.

Textbooks:

1. Patric Naughton, Herbert Schildt: The Complete Reference JAVA 2.
2. Object-Oriented Programming in Turbo C++ by Robert Lafore.
3. OOP with C++, Balguruswamy.

Reference books:

1. Applying C++ by Scoot Robert Ladd.
2. Using Turbo C++ by Herbert Schildt.
3. Teach Yourself C++ by A. L. Stevens.

304. Communication Skills & Organizational Behaviour

In this paper principles of communication, verbal and non-verbal communication skills, written communication skills will be taught. In the second section of this paper, fundamental concepts of organizational behaviour, motivation process, Group dynamics, stress management, leadership and conflict management will be taught among other related concepts of organizational behaviour.

Section – I (Oral and Technical Communication).

1. Important and benefits of communication, components of communication, principles of communication (7 C's), barriers in communication, listening skills.
2. Verbal and Non-verbal communication – face to face, interpersonal communication, body languages and KINESICS, meetings and group communications, public speaking, telephone communication, preparing for an interview, facing the interview.
3. Written communication – Resume/Bio data preparation, covering, Report writing-Short, long, business letter writing.
4. Writing of user manual, case study involving business analysis, review reports.
5. Note taking from lecturers and reference material, essay and précis writing, slide preparation, oral presentation principles, and written presentation of technical material.

Section – II Organizational Behaviour:

1. **Introduction to Organizations and Individuals:** - What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analyzing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures, basic roles in an organization etc., perception, attitudes, motives (achievement, power and affiliation), commitment, values creativity and other personality factors, profile of a manager and an entrepreneur.
2. **Interpersonal and Group Processes:** - Interpersonal trust, understanding the other person from his/her point of view, interpersonal communication, listening, feedback, counseling, transactional analysis, self-fulfilling prophecy etc., leadership, motivating people, working as a member of a team, team functioning, team decision making, team conflict resolution, team problem solving.
3. **Organizational Structure and Integrating Interpersonal and Group Dynamics:** - Elements of structure, functions of structure, determinants of structures, dysfunctional ties of structures, structure technology-environment-people relationships, principles underlying design of organizations,

organizational culture, organizational politics, issues of power and authority, organizational communications, organizational change, integrating cases.

Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role-plays, and behaviour simulation exercise.

Reference books:

1. Arnold John Robertson, Ivan T. and Cooper Carry L.: "Work Psychology: Understanding Human Behaviour in the Workplace", MacMillan India Ltd, Delhi 1996.
2. Dwivedi R. S.: "Human Relations and Organizational Behaviour: A Global Perspective", MacMillan India Ltd., Delhi 1995.
3. French and Bell (4th ed.), "Organization Development: Behavioural Science Interventions for Organization Improvement", Prentice Hall of India Pvt. Ltd, New Delhi 1994.
4. Hell Segel, Solcum and Woodman: "Organizational Behaviour", West Publishing Co. USA, 1986.
5. Hersey and Blanchard (6th ed.), "Management of Organizational Behaviour: Utilizing Human Resources", Prentice Hall of India Pvt. Ltd., New Delhi, 1996.
6. Prasad Kesho: "Organizational Development for Excellence", MacMillan India Ltd, New Delhi, 1996.
7. Robbins (4th ed.), "Essentials of Organizational Behaviour", Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
8. Schermerhorn, Hund and Osborn: "Managing Organization Behaviour", John Wiley and Sons, USA 1982.
9. Weston Mergers, "Restructuring and Corporate Control", Prentice Hall of India Pvt. Ltd., New Delhi, 1995.

305. Decision Technologies

This paper covers Decision models such as Linear Programming; Transportation and assignment problems, replacement problems. Networks, Branch and bound algorithm, Dynamic programming, CPM and PERT will be covered. However the emphasis is on using a Decision Support System such as MS-EXCEL to analyze the problem and interpret the results. In this paper, decision making under uncertainly and simulation are also covered.

1. **Statistical classification and tabulation of data:** - Algorithms to plot histograms and frequency curves, measure of central tendency and dispersion, correlation and regression. Rank correlation coefficient.
2. **Tests of Significance:** - Concepts of testing of hypothesis, test for proportions, means and variances, contingency tables, Curve fitting, SQC, Numerical Integration Iterative methods to solve equations of the form $g(x)=0$.
3. **Decision Theory:** - Formulating the problem decision criteria that use probabilities, checking whether to obtain more information using new information to update the probabilities using decision tree to analyze the problem with sequence of decisions, using utilities to better reflect the values of payoffs.
4. **Linear Programming:** - Linear programming concepts graphical methods to solve two variable problems simplex dual simplex or revised simplex methods, what if analysis, resource allocation problems, distribution network problems, transportation and assignment problems.
5. **Network Optimization:** - Minimum cost flow problem maximum flow problem shortest path problem, minimum-spanning problem. PERT and CPM Using a network to virtually display a project, scheduling project with PERT and CPM, dealing with uncertain activity durations, corresponding time-cost trade offs, scheduling on controlling project costs.

6. **(a) Inventory Theory:** - Cost components of inventory models. The basic EOQ model, EOQ model with planned shortages, with price breaks, with gradual replacement. An inventory model for reusable products. A continuous review inventory system.
- (b) Queuing Theory:** - Elements of a queuing model, measures of performance of queuing systems, single server, multiple servers, and priority queuing models.
7. **Forecasting:** - Applications of forecasting, Time sense components, models for time serves with irregular components, forecasting with regression models.

Textbooks:

1. Operation Research by Taha H. A.
2. Do it by yourself on PC by K. V. Sarma.

Reference books:

1. Gillet, B. E.: “Introduction to Operations Research: A Computer Oriented Algorithmic Approach”.
2. The Critical Path Method by Saffer L.R., Fitter J. S. and Reyer W. L.
3. Kanti Swarup, Gupta P. K. and Man Mohan, “Operations Research”.

306. Database Design and Implementation Laboratory

This is a practical oriented paper. In this paper Oracle DBMS and Developer 2000 are covered in depth. This paper covers the Application part of the topic covered in the paper Database Management – Theory (Paper 203). An important aspect is that Database Administration is also covered thoroughly.

Over view of RDBMS, Data model, Object relational, Codd’s rule, Introduction to Oracle = Architecture, Processes (Background list) Overview with Tools of Oracle: Sql * plus, PL/SQL, Forms, Reports Pre compilers (SQL Loader, Import, Export).

Introduction to SQL: DDL, DML, DTL (TCL), Data types- Character: Char, Varchar/varchar2, Long, Number, Column-name number, Column-name number (p) – fixed Point, Column-name number (p,s) – floating point, Date data type, Raw data type, Long raw data type, LOB data type, CLOB, BLOB, BFILE. Table: Constraint Definition, Domain, Entity, Referential, Create table, Drop table, Normalization (Applied)- Commands and clause, Insert, update, delete, with ‘where’ clause.

Queries and SQL functions, Select with all options, Operations and operators- Arithmetic Comparison Logical, In. not in, between, like, all, not like, %, any, exists, not exists, is null, is not null, and, or, not Query Expression Operators, Union, intersect, minus, Operators Precedence. SQL Functions- Date: Sys_date.new_time. next_day, Add_months, last_day, months_between, Numeric: round, trunk, abs, cell, cos, exp, floor, Character: initcap, lower, upper, trim.translate, length, char, Conversion: to_char, to_date, to_number, Miscellaneous: Uid, User, nvl.vsize.

Group function – avg, max, min, sum, count, Group by clause, Having clause.

Expression (Set operations: join) – Set operations- Union, union all, intersect, minus, relating data through join concept-Join Theory, simple join, equi join, non equi join, self-join, Outer join, Table aliases.

Query and sub queries, Case should be thought / Example Introduction to object oriented database, concept, object binding in Oracle, Class, Attribute, Methods, Object type Definition, Declaring and initializing Methods, Alter and Drop type.

Views and synonyms Introduction – Object type, User definition with example, create, synonym as alias for table and view, Drop, sequence- Introduction, creates with option, alter sequence, drop view, into, creates, update, drop, index, introduction, create Locks in oracle (Conceptual)- concept of locking, types of lock, row level (select... for update clause) table level – Mode, share, share update, exclusive, nowhere, deadlock Primary Introduction to DBA- User create, granting, Privileges, Object, System, User, (GRANT, REVOKE, COMMIT, ROLLBACK, SAVEPOINT).

Report writer using SQL.

Title, Btitle, skip, set pause, column, SQL.pno, Break on, Computer sum, set server output on.

PL/SQL

Introduction to PL/SQL, Advantages, Support for SQL, High productivity, Better performance Portability, Integration with Oracle.

PL/SQL Character set – data types, Character, Raw, rowed, Boolean, binary_integer, number Variable, constant.

PL/SQL blocks, Attribute, %type, %rowtype, operators function comparison, numeric, character, date.

Control structure- condition – if, interactive – loop, for, while, sequential – goto, Error handling, concept of exception – pre defined exceptions, no_date_found, cursor_already_open, dup_val_on_index, storage_error, program_error, zero_divide, invalid_cursor, login_denied, invalid_number, too_many_rows, dbms_output, user defined exceptions Cursor Management- Static cursor, Dynamic cursor, Explicit & implicit cursor, Cursor for loop, Parametric cursor, REF Cursors, Declaring cursor variables, Constrained and unconstrained cursor variables. Opening a cursor variable from a query, closing cursor variables. Restrictions using cursor variables.

Composite data types, record: declaration, refer, record assignment, table: declaration, table attribute, (count, delete, exists, first, last, next, prior), nested tables, index by tables, Varray: declaring a varray, varies in database, sorted tables, Tables vs array-Database triggers- Definition, syntax, parts of triggers (statement, body, restricted), types of triggers enabling and disabling triggers, Predicates: inserting updating and deleting, sub programs and procedures, subprograms, definition, features.

Procedure- Definition, creating, Parameter: in, out, inout, formal with implementation.

Function- Definition and implementation.

Packages.

Stored procedure and functions.

Dynamic PL/SQL.

Executing non-query DML & DDL statements.

Executing PL/SQL.

DBMS_SQL enhancements.

Privileges DBMS_SQL.

Introduction to Developer/2000 (SQL FORM.SQL REPORT, Menu and Graphics).

Textbooks:

1. ORACLE 7 by Ivan Byross.
2. Understanding ORACLE by Perry J. and Later J.
3. SQL by Scott Urman.

Reference books:

1. ORACLE PL/SQL Programming by Scott Urman.
2. Oracle- 8 DBA Handbook by Loney Tata McGraw Hills.

307. Minor Software Project - III

For this paper, the student develops software in Oracle environment. Students work in groups of not more than 4. Each student spends about 25 terminal hours. In this project emphasis is on following Software Engineering Principles. Designing Databases, normalization, report design, identification of proper test cases is also emphasized. Visual Basic or Developer 2000 may be used as front end. Writing good project report with user manual is essential.

Semester – IV

401. UML and Design Patterns

This paper is Software Engineering for Object Oriented Programming. The class, Object, and interaction diagrams of UML will be introduced. The object oriented thinking is taught using the 23

Design Patterns introduced by Gamma et al. The Design Patterns will be implemented in C++, Java and Visual Basic. This Paper is one of the most important advanced level Papers.

1. Brief history of UML, uses of UML, phases of system development. Overview of UML – views, diagrams, Model elements, UML extensions, Modeling Tools. Use-case modeling.
2. Classes, objects and their relationships classes and objects, class diagrams, Relationships, Associations. Generalizations, Interfaces (protocols), Packages and templates. Quality of models. Dynamic modeling State diagram, Sequence diagrams. Collaborations diagram, Activity diagrams. Real time modeling in UML- real time concepts, special real-time Modeling concerns.
3. Logical and Physical Architectures-Component diagram, Development diagram Extending UML- Tagged values and properties, constraints and stereotypes.
4. Introduction to design patterns- Definition, description, catalog, need of design patterns, selecting a design pattern, using a design pattern. C++ foundation classes that is used by design patterns- lists iteration, point, Rect.
5. Creational Patterns- Abstract factory, Builder, Factory method, prototype, singleton, Implementation pattern in C++ and Java.
6. Structural Patterns- Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy. Implementation pattern in C++ and Java.
7. Behavioural Patterns- Chain of responsibility, command interpreter, Iteration, Mediator, Memento, observer, state, strategy, Template methods, and visitor. Implementation pattern in C++ and Java.

Textbooks:

1. UML Fool Kit by Hans-Erik Erikson and Magnus Penker.
2. Design Patterns- Elements of reusable by Enrich Gamma, Richard Helm, Ralph.
3. Object-oriented software by Johnson and John Vlisside.

402. Unix and Linux Internals

This paper covers in depth all aspects of Unix and Linux operating systems. System calls and interfacing with C will also be taught. Shell programming is an important component of this Paper. The Unix/Linux administration will also be covered at elementary level.

1. History, system structure, user perspective, operating system services, Architecture, system concepts.
2. Single and compound commands, shell scripts, use of c-programs, building command library of program.
3. Kernel data structure, system Administration, Buffer cache, internal representation of files. System calls and c-library system calls and library functions, systems calls for the file system.
4. The structure of processors- process and transaction, layout of system memory, context of a process, saving the context of a process, manipulation of the process address space, sleep. Process control – creation, signals, termination, involving other programs, the user ID of a process, the shell, system boot and init process. Process scheduling and time.
5. Memory Management policies- Swapping, demand paging, hybrid system, the I/O sub system-driver interfaces. Disc Drivers, Terminal Drivers, streams.
6. Inter process communication sockets, socket system calls, reserved ports, and passing file descriptors, socket implementation.
7. Advanced Unix/Linux programming concepts.

Textbooks:

1. The Design of the Unix Operating System – by M. J. Boch.
2. Advance Unix – A Programming Guide- by Stephen Prata.

Reference books:

1. Unix System V Release 4 – by Sumitabha Das.
2. Advanced Programming in the Unix Environment – by Stevens W. R.
3. Unix Shells – by Vijay Mukhi.

403. IT Elective-I

Theory of Automata

1. **Introduction:** - Set theory – Definition, finite and infinite set, countability of a set, cardinality of a set, closure of a set. Mapping between sets, functions and relations, closure properties of relations. Basic concepts – symbols, alphabet, string/word. Language – Definition, language states, difference between natural and formal language. Mathematical preliminary – Induction, Graphs and Trees – basic definitions, Basic machine – concept only.
2. **Finite State Machine (FSM):** - Definition, Finite control, Transition graphs, adjacency matrix. (FSM must be dealt with machine function and state function). Finite automata (FA) – Deterministic Finite Automaton (DFA) and Non-deterministic Finite Automaton (NFA), Language acceptance by FA. Moore and Mealy machines – Definition, models, interconversion.
3. **Regular Expressions:** - Recursive definition of Regular Expression, Regular set-recursive definition, NFA with E-moves – definition, NFA without E-moves, Interconversion between NFA and DFA. Regular expression and FA. Regular sets- Properties, pumping lemma. FA limitations.
4. **Grammars:** - Definition, production rules, Formalization, derivation trees, ambiguous grammar, removal of ambiguity. Reduced form grammar – removal of unit productions, E-production, useless symbols, Chomsky hierarchy, Context Free Grammar (CFG) – definition, simplification of CFG, Context Free Language (CFL)- definition, inherently ambiguous CFLs, Regular grammar – definition, left linear and right linear Regular Grammar. Interconversion between left linear and right linear regular grammar. Regular grammar and Finite Automata Normal Forms – Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Derivation graphs – type 0 and type 1 grammars.
5. **Pushdown Stack Memory Machine:** - Formal definition, pushdown Automata (PDA), Deterministic Push Down Automata (DPDA) –definition, Non-deterministic Push Down Automata (NPDA) –definition, Relative powers of DPDA and NPDA, PDA and CFG and their closure properties.
6. **Post Machine and Production System:** - Definitions, Comparison between PDA and Post machine, Axioms, Post canonical systems, PMT systems, acceptors and generators, Markov algorithm and labeled Markov algorithm.
7. **Turing Machine:** - Introduction, Definitions, model, comparison of Turing Machine – (TM), FSM, PDM and PM Examples of TM, combinational TM, iterative TM, recursive TM, Church’s Turing hypothesis, multistack Turing machine, TM limitations, halting problem, incompleteness and undecidability, Solvability, Semi-solvability and unsolvability of problems (only concept required).
8. **Applications:** - Application of RE and PA – Lexical analyzer. Text editor and searching using RE. Application of PDA – Expression conversion. Application of CFG – syntax analysis, language definition.

Reference books:

1. E. V. Krishnamurthi: “Theory of Computer Science”, EWP publications.
2. Hopcroft Ullman: “Introduction to Automata Theory, Languages and Computations”, Narosa.
3. John C. Martin: “Introduction to Language and Theory of Computation”, McGraw Hill.
4. Daniel LA. Cohen: “Introduction to Computer Theory”, Wiley Publications.

403. IT Elective-II

Data Warehousing and Data Mining

This subject deals with the concept of data warehousing for effective storage of large data sets and the data mining techniques, which are effectively used in knowledge discovery from databases. The emphasis is on data mining algorithms.

1. **Data ware housing:** - Characteristics of a data warehouse, data marts – types, maintenance, nature of data in a data mart, software components of a data mart, performance issues. For data warehousing, performance considerations.
2. **On line Analytical Processing OLTP and OLAP Systems,** Data modeling- Star schema, Snow Flake schema, OLAP tools.
3. **Data Mining (DM) AND knowledge Discovery (KD):** - Defining KDD, Architectures of KDD, Knowledge representation, Basic models of DM, KD and related areas, main features of KD Process. Data Cleaning, Data integration and transformation, Data Reduction.
4. **Cluster Analysis:** - Unsupervised learning, Hierarchical clustering, objective functions-based clustering, clustering methods and data mining.
5. **Decision Trees:** - Definition, segmentation with purpose, applying decision trees to business, using decision base for exploration, for data processing.
6. **Deriving Association Rules:** - Concepts, application, Rough Sets – Information system, Indiscernibility relation, Discernibility matrix, decision tables, Definable and non-definable sets, accuracy of approximation, accuracy of classification, reduct and core, decision rules, Dynamic Reducts, Algorithm for finding minimal subsets.

Textbooks:

1. Data mining methods for knowledge discovery – Krzysztof J. Cios, Witold Pedrycz and Roman W. Swiniarski.
2. Classification and Regression Trees by Breiman L. Friedman, J. H., Olshen R.A. and Stone C.J.
3. Data/warehousing concepts techniques and applications by Prabhu.
4. Data Mining Techniques by Arun Pujari.
5. Data Mining by Ivan Kamberly.

403. IT Elective-III

Embedded System Concepts & Modeling

1. **Introduction to embedded systems:** - Understanding embedded systems, Applications of embedded systems, Categories of embedded systems, Requirements of embedded systems, Trends in embedded system development.
2. **Microprocessor and Micro-Controller Based Embedded Systems:** – 8-bit microprocessor, 16-bit microprocessor, System design using microprocessor, 8-bit micro-controller, System design, using micro-controller.
3. **Embedded and Real-Time Operating Systems:** - General purpose operating system, Embedded Operating system, Real-Time operating system.
4. **Related Concepts Involved in Embedded Systems:** - Digital signal processing, VLSI designing, Distributed computing, Wireless networking. Parallel programming.
5. **Embedded System Modeling Using UML:** - Concepts involved in embedded systems. Soft and hard real-time systems. Classes involved in system. Use cases. Interaction among different classes, Sequence diagram. State changes in system, Deployment.

Books:

1. UML in a Nutshell by Albir.
2. Real-Time UML by Douglass.
3. Microprocessor Architecture, Programming & Applications by Gaonkar.
4. An Embedded System Primer –by David E. Simon.

404. IT Elective-I

Programming with STL

1. Introduction to STL (Standard Template Library).
2. Sequences: Introduction to sequence containers, vector, deque and list class. std::stack, std::queue, std::priority_queue container adapter.
3. Associative container: Set, Multiset, Map, Multimap and Bitset class template.
4. Generic algorithms: Introduction to generic algorithm, non_modify sequence algorithm, mutating sequence algorithm, sorting algorithm and numeric algorithms.
5. Iterators: Introduction to iterators, input, output, forward, bi-directional, random-access, and special purpose: stream iterators. Iterator adapter. Exception handling: exception handling in C and C++, Try block, Catch exception handler, throw statement, try/throw/catch sequence, exception specification, unexpected exceptions, catch- all exception handlers, throwing an exception from an handler, uncaught exception.
6. Namespaces: Introducing Namespaces, using Namespace statement, defining namespace, nested namespaces, unnamed namespaces, namespace aliases.
7. New Style casts and RTTI: New style casts: dynamic cast, static cast, reinterpret cast, const cast. Runtime Type Information (RTTI).
8. Locales: Elements of Internationalization, local class: the standard facets, default and global locales, creating a locale object, creating a mixed locale, stream and locales, manipulating facets.

404. IT Elective-II

Embedded System Design & Programming

Embedded System Design: - Processor, Memory, Latches and buffers, Crystal, Reset circuit, Chip-select logic, ADC and DAC, Application specific control circuitry, Delay units, Keypads, Programmable logic devices.

Development Environment For Embedded Systems: - Target hardware platform, Development platform, Programming languages, Operating systems, Development-tools.

MCS-51 Series: - Micro-controller Based Embedded System Design and Programming: Internal architecture of 8051 micro-controller, 8051-assembly-language programming, 8051 interfacing, Programming on MCS-51 kit.

Books:

1. The 8051 Micro-controller – Architecture, Programming and Applications – by Kenneth J. Ayala.
2. The 8051 Micro-controller and Embedded Systems – by Mazidi and Mazidi.
3. Fundamentals of Embedded Software Where C & Assembly Meet by Lewis.

405. BM Elective-I

Marketing Management

The aim is to impart knowledge to students on concepts of fundamentals of Marketing, Core marketing planning process, Marketing mix and strategies adopted in different market situations.

1. Introduction to Marketing – Concepts of Need, Want, Demand, market, product, value and marketing. Evolution of marketing philosophy. Marketing process and functions of marketing managers.
2. Marketing Organization structure.
3. Consumer Behaviour – Household Buyer, Organizational Buyer Behaviour, market segmentation in Household and Organizational market.
4. Marketing Environment, Marketing Environment in India.
5. Marketing Research – Importance, Scope, and limitations, Research methodology, Sales forecasting marketing information system.

6. Marketing planning and strategy – Target market selection, Positioning strategies and Overview of marketing Mix.
7. Product Management – Concept of Product mix, Product life cycle, packaging, branding and pricing strategies.
8. Sales and Distribution Management – Selection and training of sales staff, allocation of territories, sales force management, personal selling process, deciding channels of distribution, channel conflict, Sales report and sales analysis.
9. Promotion Management – Advertising and sales promotion.
10. Marketing of services – Characteristics of services, marketing mix in services marketing, marketing of IT and related services.
11. Marketing Control.

Textbooks:

1. Marketing Management by Philip Kotler.
2. Principles of Marketing by Kotler and Armstrong.
3. Fundamentals and marketing by Stanton Etzel Walker.
4. Modern Marketing Management by R.S. Davar.
5. Marketing Management – Indian Context – by Ramaswammy, Namkumari.

405. BM Elective-II

Managerial Economics

1. Nature and scope of managerial economics. Objective of the firm managerial and behavioural theories of the firm.
2. Concepts of opportunity cost, incremental, time perspective. Principal of discounting and equimargins. Demand analysis – purpose and concepts. Elasticity of demand. Method of demand forecasting.
3. Product and cost analysis: Short run and long run average cost curves.
4. Law of supply: Economies and diseconomies of scale. Law of variable proportions.
5. Production function: single output isoquants.
6. Pricing: Prescriptive approach. Price determination under perfect competition. Monopoly, oligopoly and monopolistic competition. Full cost pricing, product line pricing. Pricing strategies.
7. Profits: nature and measurement policy. Break-even analysis. Case study.

Books:

1. Management Economics by Dean J.
2. Management Economics by Mote V. L.

406. Internet Programming Laboratory

This is practical paper. In this paper the concepts of internet are reviewed. Also various scripting languages HTML, DHTML, Java script, VB script XML, PERL are taught in this paper. Software Engineering for Web Application is also covered in this paper.

1. **Components of Internet Technology:** - Clients, Servers, Browsers, Internet, Applications, World Wide Web, Introduction to HTML, Web Publishing, Common HTML, Links and Addressing, HTML and Images. HTML and other Media, Layout, Style Sheets, HTML Forms, Client Side Script Programming, Delivering Web Sites.
2. **JAVA Script and VB Script:** - Identifiers, Operators, Controlling JAVA script, Web browser object Model, Window objects, Predefined functions, even handling.

3. **Developing Tool:** - Front Page, Introduction to Front Page, working with Explore and Editor, images, tables, creating functions, styles, creating forms using wizards, front page components, cold fusion-basic cold fusion, security techniques, cold fusion applications.
4. **Introduction to XML and XSL:** - Components of XML, Document type definition, working with cascaded style sheets, Extensible style language, XML Schemas and name spaces, document object model, channel definition format, connectivity of JAVA-XML and data base, VB XML and data base.

Textbooks:

1. HTML- Teach Yourself Web Publishing by Laura Lemey.
2. Programming in JAVA Script by Tim Richey.
3. Advanced Cold Fusion by Ben Forta.

Reference book:

The Complete Reference HTML by Thomas Powell.

407. Minor Software Project-IV

In this paper, students in groups of at most 4 each work on Software Project. The projects are concerned with web designing. Each student is expected to spend 25 terminal hours. At the end of the work, as project report will be prepared. As every aspect of Software prepared Engineering is covered, this project work is expected to follow all the professional guidelines for software development.

M.C.A. – III (Third Year)

Semester – V

501. Software Project Management

In this paper coding standards, Software quality assurance. Testing aspects, software metrics, cost estimation, software maintenance issues will be discussed in depth.

1. Introduction: Project and Project Management, Key characteristics to distinguish the project, Software projects Vs there projects, Overview of Project Management phases viz. initiation. Steady State, termination. Project Management Concepts. Software Project Management Plan (SPMP). Introduction to the PMBOK (Project Management Body of Knowledge)- PMI.
Case study: Identify the phases of the given project e.g. e-mail system, Library Management etc.
Reference material: “No Silver Bullet: Essence and Accidents of Software Engineering”, Paper by Brooks F. P.- IEEE.
2. Requirement Engineering: - Requirement Elicitation, Types of requirement, Requirement Anaysis, Requirement Specifications, Requirements validation, Requirement Analysis Document (RAD).
Case study: Prepare the RAD for the given project.
3. Software Effort and Cost Estimation: Software Cost Factors, Cost Estimation Techniques, COCOMO models, Empirical models, Model Tuning, Function Point Analysis.
Case study: Estimate the effort and cost for the given project.
Reference materials:
 1. “Software Engineering Economics”, paper by Barry Boehm- IEEE.
 2. “Software Function, Source Lines of Code and Development Effort Prediction: A Software Science Validation”, paper by Albrecht A. J. and J. Gaffney –IEEE.
4. Resource Planning and Scheduling: Work Breakdown Structure (WBS), Project Scheduling- PERT/CPM methods, Gantt chart, Project Organizations, Team Structures.
Case study: Using MSP 98 or MSP 2000.
5. Risk Management: Elements of Risk Management, Risk Analysis, Risk Prioritization, 10 risks in Software Projects and their mitigation.
Case study: Prepare a Risk Management Plan for a given project Reference material: “Software Risk Management: Principles and Practices”- paper by Barry Boehm- IEEE.

“Risk Management For Software Projects” – paper by Fairley R. –IEEE.

6. Software Quality Assurance and Processes: Software metrics, metrics for quality, Testing concepts, Quality Systems-ISO, CMM. Software Processes- Comparative study of Waterfall model, Spiral model, Rational Unified Process.

Reference books:

1. “A Spiral Model of Software Development and Enhancement”, paper by Barry Boehm-IEEE.
2. “Characterizing the Software Process: A Maturity Framework” paper by Humphrey W.S.-IEEE.

Textbooks:

1. Software Project Management- Readings and Cases by Chris F. Kemerer, McGraw Hill Publication.
2. Object Oriented Software Engineering – conquering Complex and Changing Systems by Berno Bruegge, Allen H. Dutoit-Prentice Hall International Edition.
3. Software Project Management-A Unified Framework by Walker Royce-Addison-Wesley.

502. Artificial Intelligence and Applications

The nature of the AI problems and their solutions are entirely different from what has been dealt with so far in other papers. This paper covers artificial intelligence theory- knowledge representation schemes, knowledge manipulation in every scheme and various graph search techniques. The AI language PROLOG and if possible LISP will be taught. Applications include elementary introduction to Natural Language Processing, Expert Systems, Learning and Pattern recognition.

1. **Scope of AI:** - Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques-search knowledge abstraction.
2. **Problem solving:** - State space search: Production systems. Depth first, breadth first search, heuristic search- Hill Climbing, best first search, branch and bound, Minima search, Alpha-Beta cut offs.
3. **Knowledge Representation Predicate Logic:** - Solemnizing queries, Unification, Modus ponens, Resolution, dependency directed backtracking.
4. **Rule based Systems:** - Forward reasoning, conflict resolution, background reasoning. Use of no back track.
5. **Structured knowledge Representation:** - Semantic net; slots, exceptions and default, frames.
6. **Handling uncertainty:** - Probabilistic Reasoning. Use of certainty factors. Fuzzy logic.
7. **Learning:** - Concept of Learning. Learning automation, genetic algorithm, learning induction, neural nets back propagation.
8. **Expert Systems:** - Need and justification for expert systems, knowledge acquisition. Case studies: MYCIN.RI. VIDWAN Expert System Shell.

Books:

1. Introduction to AI and Expert systems – by Patterson.
2. Principles of AI by Nilsson N. J.
3. Artificial Intelligence by Rich E. and Knight K.
4. Foundation of AI and Expert Systems by V. S. Janakiraman, K. Sarukesi, P. Gopal.
5. AI with Common LISP by Krishnan J. L. Noyes.
6. Rules based Expert System by Sasikumar M. Ramani S.

503. IT Elective III

Design of Language Processors

1. Classification of grammars: Context Free Grammars. Deterministic finite state automata, Non-DFA.
2. Scanners down parsing, LL grammars, Bottom up parsing, polish expression operator... grammar. IR diagram. Comparison of parsing methods. Error Handling.
3. Linking and loading Allocation ... various schemes of linking and loading,... absolute and relocated loader, concept of ... static and dynamic Linking. BSS loader.

4. Assembler: Statements, simple assembly scheme. Forward reference, pass structure, design of 2 pass assembler, symbol table, op-code table, intermediate code, work distribution in 2 passes. Assembler implementation.
5. Symbol table handling techniques, Organization for structured and non-structured languages.
6. Run time storage admin, static and dynamic allocation, Intermediate forms of source programs. Polish N-tuple and syntax trees. Semantics analysis and code generation.
7. Code optimization, Folding, redundant sub-expression evaluation. Optimization within iterative loops.
8. Interpreters: Interpretive execution, Interpretive languages, structure of interpreter, partial compilation (intermediate code).
9. Editors-line, window, screen editors, stream and structure editors, design and implementation issue.
10. Debuggers: Functionality info. required by debuggers, debugging techniques, case study- UNIX system V.

Textbooks:

1. Principles of Compiler Design by Atio Ullmanans Sethi.
2. The Theory and Practice of Compiler Writing by Temblay.

References:

Lex and Yacc: Levine et al.

503: It Elective – III

Computer Graphics and Multi Media

1. **Introduction** : The origin of computer graphics, computer graphics applications, working of interactive, computer graphics display, the user interface, Picture representation, Graphics devices, concepts of display, file and display processors.
2. **Two dimensional Transformation** : Principles, translation, rotating, scaling, Homogeneous coordination, matrix representation.
3. **Clipping and Windowing** : Line clipping algorithm, midpoint subdivision algorithm, polygon clipping, viewing transformations, window transformation
4. **Raster Graphics** : Line generation, algorithm, Bresenham's line generation algorithm, circle generation, Ellipse generation, frame buffer & mathematical curves presentation of raster image, scan converting, line drawings.
5. **Three dimensional Graphics** : 3 dimensional geometry, reconstruction of 3-D image, 3-D geometric transformation, inverse transformation.
6. **Shading** : Basic terminology, shading model, angle calculation, and transparency, surface shading methods.
7. **Curves & fractals** : Terminology, curve interpolation, image processing, Animation, 3-D Solid modeling, Multimedia technology applications.

Text Books:

1. Principles of Interactive Computer Graphics – **Newmann Sproull.**
2. Procedural Elements for Computer Graphics – **David Rogers.**
3. Computer Graphics : A Programming Approach – **Steven Harington.**
4. Mathematical Elements of Computer Graphics – **David Roger.**
5. Computer Graphics – **Bhandari S.P and Joshi S A.**

503: It Elective – III
Embedded System Interfacing
&
Embedded Communication Systems

Digital Interfacing : Keyboard interfacing, LED interfacing, LCD interfacing, Servo-motor interfacing, Pulse measurement.

Analog Interfacing: Digital-to-Analog converter interfacing, Analog-to-Digital converter interfacing, ADC techniques, DAC techniques.

Interrupts: Interrupt vector table, Hardware interrupts, Software interrupts, Interrupt service routines.

Serial Port Communication: Asynchronous serial communication, Synchronous serial communication, USB communication.

Parallel Port Communication, LAN Communication: Ethernet connectivity, TCP/IP protocol stack, Communication protocols, Communication services, System integration.

Books:

1. The 8051 Micro-controller – Architecture, Programming and Applications – by **Kenneth J. Ayala.**
2. The 8051 Micro-controller And Embedded Systems – by **Mazidi and Mazidi.**

504: IT Elective – IV
Dot Net Technology

1. **Introduction to .Net Technology :** What is .NET initiative and framework. Components of .NET Common Language Runtime (CLR) and services offered by CLR. What are Common Language Specification (CLS) and its need. Language compilers that support CLS. What is Intermediate Language code. JIT Compiler and its benefits. Components in .NET. Assemblies and deployment Manifest, metadata and extending metadata. Global Assembly Cache. Namespaces.
2. **VB.Net:** Differences in VB 6.0 and VB.NET VB.NET language Introduction to Object Oriented Programming in VB.Net Exception Handling ADO.NET Events and delegates Introduction to Multithreading Use of Attributes
3. **Developing web applications in ASP.NET:** Introduction to web applications using ASP.NET, comparison with ASP web application components and configuration including web.config and global. asp introduction to web forms, page derivatives code behind pages and programming includes error handling event handling, page redirection state management – server side (view state, application and session state) web controls : HTML controls and ASP.NET server controls validation using validation controls using .NET components on web forms data access on web form using data reader inserting and updating data from web forms introduction to ASP.NET web services writing ASP.NET web service consumer ASP.NET pages caching partial page caching using user controls composite controls.

References:

1. VB programming Black book by **Dreamtech covers all the topics from beginning.**
2. Little black Book.
3. Bible - **VB.Net prg Freamtech.**
4. Prg VB.NET 2003 **O'Reilly Covers topics from scratch till Web Appl, Attributes, Remoting,**

Threads.

5. Prg in VB.Net **Microsoft Press** covers topics from framework intro but no data handling.
6. VB.NET **Microsoft Press, Balena.**

504: IT Elective – IV

Programming with MFC

1. Introduction to MFC(5)MFC Class Hierarchy, CwinApp, Cwnd, Cmainframe classes, Handling Windows message in MFC, Document/View Architecture : Cdocument and Cview, C++ Template classes review, Basic MFC classes : Cstring, Cpoint , Csize, Crect, Carray and Clist.
2. Graphics Device Interface(GDI) (3)- CclientDC, CwindowsDC and CpaintDC classes, stock GDI Objects. Colors and Fonts, Drawings shapes and curves, Cbitmap, Cbrush, Cfont, Cpalette, Cpen, Crgn Classes.
3. Dialog Box(3)- Cdialog, Cedit, Cbutton, Clistbox, Ccombobox classes, Data exchange to from variables and controls. OK and Cancel buttons, Tab stops and groups, Modeless dialogs.
4. Windows Controls and Dialogs(7)- Cprogressbar, CsliderCtrl, CspinbuttonCtrl, Clistctrl, CtreeCtrl classes, Cfiledialog, CcolorDialog, CfontDialog, CprintDialog classes, Toll bar, Tool tips and status bar : Ctoolbar, Cstatusbar. Property Sheets : CpropertyPage class. MFC Text Editing : Ceditview, richEditView, CrichEditCtrl, date time picker, month calendar, Ip Address control, extended combo box controls. Exception Handling : Cexception.
5. Menus and accelerators(2)- Command Processing., Cmenu, CcmdUi classes., Floating Pop-Up Menus, Keyboard accelerators for menus, Enabling and Disabling menu items.
6. Multithreading (3) - Multithreading Concepts : Cwin Thread, Thread Synchronization, Criticalsection, Cmutex, and Csemaphore. Event Signaling, event object : Cevent.
7. Advanced Document Handling(6)- Clistview, Ctreeview, Cformview and CrecordView, Document templates : CdocTemplate, CsingleDocTemplate and CmultiDocTemplate CframeWnd and CsplitterWnd . User defined message handling , Drag and Drop, Context-Sensitive help.
8. Dynamic Link Libraries(DLL)(2)- MFC Extension DLL : Exporting classes, MFC : Regular DLL Basic Component Object Model (COM) (8), what is COM and why COM?, Interfaces , definition language, Iunknown, Iclass Factory Interfaces, In-process and out-of-process servers, Marshaling, Containment and Aggregation, Difference between ActiveX controls and ordinary Controls, Wrapper classes for ActiveX controls, Data exchange between variables and ActiveX control properties, Mapping ActiveX control events, Case study : Calendar and Web Browser controls.
9. Database Connectivity(6) -ODBC : Cdatabase and Crecordset, Data binding, Dynamic data binding, snapshots, dynaset. Data Access Objects(DAO) : CdaoWorkspace, CdaoDatabase, CdaoRecordset, CdaoTableDef, CdaoQueryDef., OLE DB Consumer, Cdatasource, Cenumerator, Csession, Caccessor, CdynamicAccessor, CdynamicParameterAccessor, CmanualAccessor OLE DB Provider.

Text Books:

1. Programming Microsoft Visual C++, **5th edition, David j Kruglinski, Gerorge Shepherd, Scot Wingo Microsoft Press 1998.**

504: It Elective – IV

Embedded System Programming Using High-Level Languages

1. **C in Embedded Systems:** Data types, Bit-wise operations, Logical operations, Structures and unions, Pointers, Data structures, Memory management, Code optimization.
2. **Connecting C with Assembly:** Inline assembly code, Linking assembly and C object files.

3. **Device Driver Programming in Linux:**User-mode and kernel-mode programming, Dynamic kernel module programming, Character devices, Block devices, Device driver programming, Proc file system.
4. **Java in Embedded Environment:** J2ME, Jini.

Books:

- 1.Fundamentals of Embedded Software Where C & Assembly Meet – by **Lewis**.
- 2.Programming for Embedded Systems – by **Deamtech**.
- 3.C With Assembly Language – **Braddy**.
- 4.Device Driver programming -- **Rubini**.

BM Elective - II

Design of E-Commerce Applications

1. **Introduction to Internet Commerce and Commerce value Chain:** Introduction, Internet Commerce, Business and Technical issues of IC, Internet, Characteristics of Internet, Introduction of commerce value chain, doing business internationally, Internet Business Strategy.
2. Business Models, Goals and requirement: Business segments, Consumer Retail, Business-to-Business Cataloging and Information Commerce, Goal of participants, Role of Standards, Privacy, Merchandising, SET.
3. **Functional Architecture and Implementation Strategies:** Introduction, Core Architectural Ideas, Roles, Components, Example of System Architecture, Planning the Implementation, Outsourcing, Custom Development, Role of ISP, Project Management, Multi-organization Operation.
4. **Building Block for Internet Commerce and World Wide Web:** Design principle of the Internet, Core Network Protocol, Domain Name System, Web Fundamentals, Content Transport, Server Component, Programming Clients, Session and Cookies, Object Technology, Commerce client Technology, Technology for fulfillment of digital goods.
5. **System Design, Creating and Managing content and Cryptography:** Philosophy of Design, Fundamental Design Issues, Basic contents, Tools for Creating Content, Manage the Content, Multimedia Presentation, functions of cryptography, types, Evaluation of Cryptography, Symmetric and Asymmetric Cryptography, Public Key Cryptography, Protocols, Key Management.
6. **Security and Payment System :** Security for Internet Commerce, Security Design, Analyzing Risk, Basic computer Security, Client Security Issues, Server Security Issues, Authentication, Real world Payment System, Smart Cards, Internet Payment System, Online Credit Card Payment, Electronic Cash.
7. **CASE STUDY:** Auxiliary Systems, Transaction Processing, Future of Internet Commerce.

505: BM Elective – II

Knowledge Management

1. Concept of data, information, types of information, features of quality information, Evaluation of information system. Components, structure of information, levels of information system, traditional types of Information system; TPS, MIS, EIS/SIS, modern information system-DSS, ES, Office Automation.
2. **Knowledge Management-** Definition, evaluation of Knowledge Management, challenges of KM, KM Organization, benefits of KM, reasons for implementation of KM, Key attributes of knowledge, 8 C's successful KM, KM drives, KM Myths.
3. **Knowledge-** Concept, knowledge, intelligence, experience, common sense, types of knowledge, human thinking and learning.
4. **KM Life Cycle-** Challenges in building KM Systems, Difference between SDLC and KMSL, users Vs knowledge workers, Phases of KMSLC-Evaluate existing infrastructure, Form the KM team, knowledge capture, Design of KM, blue print, verify and validate the KM system, Implementation

KM system, Manage change and rewards structures, post system evaluation, role of the knowledge developers in each phase.

5. Knowledge creation, Nonaka's model of knowledge creation and transformation, knowledge architecture, identifying knowledge centers, technical core-The user interface layers, Technical layers of the KM.
6. **Capturing Tacit Knowledge**- Concept, Evaluating the experts-level of expertise, capturing single and multiple experts, advantages and drawbacks of using single experts and multiple experts. Developing a relationship with experts, Fuzzy reasoning and the quality of knowledge capture, the interview, guide to successful interview, benefits and drawbacks of interview. Other knowledge captures- on site observations, Brainstorming-Electronic, Brainstorming, protocol analysis, Concept of Scenario, Protocol procedure of the diabetic foot KM system, Nominal Group Technique (NGT)-The Delphi method concept mapping – procedure semantic nets, Black boarding.
7. **Knowledge codification**- Concept of codifying- Diagnosis, Instruction, interpretation , planning and scheduling, prediction, role of planning, models of knowledge conversion, steps to codify knowledge, codification tools and procedures. The knowledge developers' skill set.
8. **System Testing and Deployment**- Quality and Quality assurance, knowledge testing, approaches to logical Testing, user acceptance testing, Managing testing phases, KM system deployment, issue related to deployment and user training and deployment, review of post implementation.

Text Book:

1. Knowledge Management – **By. Elias M. Awad and Hassan M. Ghaziri Pearson Education.**
2. Leading with Knowledge–**Knowledge Management Practices in Global Infotech. Companies. By. Madanmohan Rao, Tata McGraw-Hill .**
3. Knowledge Mgt. Field Book – **By Bukowitz W.R. and William R.L.**
4. Knowledge Management. Strategies – **By Honeycut, Prentice Hall of India.**
5. Knowledge Management System – **By Barnes S, (Theory and Practice) Thomas Learning Publication.**

506. Network and Internet Programming. (Laboratory)

This is a practical oriented paper. Aim is to cover socket Programming Advanced Java Programming, CORBA, COM,DCOM and other related concepts.

1. **Internet** – Concept, Components of Internet Technology, Components for developing and Implementing Internet Based Applications- Proxy server, Personnel Web server, IIS, Methods of deploying web Applications. Installation of Proxy Server, PWS, IIS and FTP Browser. NGI Internet Protocol V6, UUCP, IPX/SPX for LANS, Protocol Comparison.
2. **Berkeley Sockets** – Overview, Unix domain protocols, socket addresses, socket system calls, reserved ports, passing file descriptors, I/O asynchronous and Multiplexing, socket implementation.
3. **Win sock Programming** – Using the windows socket, API window sockets and blocking I/O, other window extensions, Network dependents UNRI (), DLL, sending and receiving data over connections termination.
4. Intranet, **Virtual Private Networks**, WAP concepts.
5. **Introduction to Networking with JAVA**, JDBC, JNI, Java Beans and EJB.
6. **Introduction to CGI and Perl**, Java Web Servers, Java Servlets, Distributed Java Programming (RMI) Active Server Pages (ASP), Java Server Pages (JSP).

Text Books:

- 1.Windows Network Programming by **Devis.**
- 2.Unix Network Programming by **Steven.**

Reference Books :

- 1.Creating and Implementing Virtual Private Networks by **Casey Wilson, Peter Doak.**
- 2.White paper on VPN using Windows 2000 (**www.microsoft .com**).
- 3.White paper on specifications and Documentation from **WAP forum (www.wapforum.com)**

507. Minor Software Project - V

In this paper, the student group has to choose a problem and develop software using any application development environment. Now the students have thorough grounding of all most all aspects of theory and Practice of information Technology, they have to show that they are productive, original in thinking and capable of doing work diligently. Project report must reflect that they are ready to take any kind of responsibility, they are good in communication, and that they can be on their own.

Semester – VI

601. Major Software Project

This paper carries 400 marks. Every student must go to an organization and spend 150 days in the organization working on a problem which the organization suggests. At the end of the work, the student shall submit a project report, which will be evaluated by a committee of examiners appointed by the University. Out of these 400 marks, 100 marks will be for Project Work, 100 marks will be for Project report, 100 marks for the presentation of the work and 100 marks for Viva. The work should be equivalent of 225 hours of terminal time. Another 225 hours must be spent on preparation, report writing etc.

602. Trends in Information Technology-Term Paper

For this paper, the student chooses an IT topic, collects literature, understands and writes a report. The report will be evaluated for 100 marks based on presentation and viva.

603. Comprehensive Examination (Objective Type)

604. Comprehensive Examination (Conventional Type)

For these two papers, the student has to prepare on his/her own. The syllabus for the two papers will be based on Papers 101, 102, 103,105, 201,202,203,301,302,303, 402 Detailed syllabus will be given for these two papers later.
