Department of Computer Science & Information Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

SYLLABUS FOR MSC COURSE UNDER CHOICE BASED CREDIT SYSTEM (CBCS) *

Session 2017-18(on and after)

M.Sc(CS)

Note: The decision of the GG Vishwavidyalaya for implementing CBCS system on this course shall be final, rest will remain the same.

Semester 1

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-101	Introduction to Information Technology	4		40	60	4
2	MSC-102	Computer programming & Numerical Methods	4		40	60	4
3	MSC-103	Discrete Mathematical Structures	4		40	60	4
4	MSC-104	Data Structures using C	4		40	60	4
5	MSC-105	Computer Organization	4		40	60	4
6	MSC-106	LAB-I: Data Structure using C		1		100	1
7	MSC-107	LAB-II: Computer Hardware and Digital Electronics		1		100	1
		Total	20	02	200	500	22

Semester 2

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-201	Principles of Operating system	4		40	60	4
2	MSC-202	Object Oriented Programming with C++	4		40	60	4
3	MSC-203	Theory of Computation	4		40	60	4
4	MSC-204	Elective I	4		40	60	4
5	MSC-205	Elective II	4		40	60	4
6	MSC-206	OOP Lab (C++)		1		100	1
7	MSC-207	LAB based on Elective-II		1		100	1
		Total	20	02	200	500	22

Semester 3

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-301	Probability and Statistics	4		40	60	4
2	MSC-302	Artificial Intelligence	4		40	60	4
3	MSC-303	Relational Data Base Management System	4		40	60	4
4	MSC-304	Elective III	4		40	60	4
5	MSC-305	Elective IV	4		40	60	4
6	MSC-306	RDBMS LAB		1		100	1
7	MSC-307	LAB based on Elective III / IV		1		100	1
		Total	20	02	200	500	22

Semester 4

M.Sc. (CS)IVth Semester			
S.No.	**Subject Code**	**Subject**	**Total Marks**
1.	M.Sc. (CS)401	Major Project (Viva Voce)	500
Total			500

ELECTIVES

Sl.No	Paper Code	(1)	(2)	(3)
1	MSC-204 (Eletive-I)	Computer Networks	System Analysis and Design	Introduction to Micro Processor
2	MSC-205 (Elective-II)	Object Oriented Software Engineering	Multimedia	Linux Operating System and Shell Programming
3	MSC-304 (Elective-III)	Advanced JAVA Programming	System Software	Neural Network
4	MSC-305 (Elective-IV)	Web Technology	Pattern Recognition	Compiler Design

*** The syllabus is subjected to change as per the requirement.**

MSC-101

Introduction to Information Technology

1. **Introduction-** Basics concept of IT, Concept of data and information, Generations and Classification of Computers, Organization of computers: CPU, Memory, Input and Output devices, File organizations.

2. **Software and Computer Languages-** Software, Types of software: System software, Application software, Utility software, Firmware. Generations and Types of Programming Languages, Programming Paradigms: procedural oriented and object oriented programming, Computer Security.

3. **Communications and Internet-** Data communications, Analog and digital signal, Communication media, Network topology, Network categories, The OSI model and TCP/IP model, Internet addressing, Internet Service Provider (ISP), Web browsers, URL, WWW, HTTP, E-mail, File transfer, Domain Name System (DNS), Wireless technology: GPS, Wi-Fi.

4. **Applications of IT-** IT in Home, Entertainment, Business, Industry, Science, Engineering and Medicine, Online banking, Online shopping, E-Learning, E-commerce, M-Commerce, E-Government.

5. **Latest IT Trends-** Artificial intelligence, Data warehousing, Data mining, Overview of geographic information system (GIS), Cloud computing, Information and communications technology (ICT), Parallel computing, Introduction to web services.

Readings:

1. Fundamental of Computer 5th Edition By V. Rajaraman, PHI Publication.
2. Introduction to Information Technology by V. Rajaraman, PHI Publication.
3. Information technology today By S. Jaiswal.
4. Fundamental of IT: Leon and Leon, Leon Tec World.
5. Introduction to Information Technology by Aksoy and DeNardis, Cengage Learning.

MSC- 102

Computer Programming and Numerical Methods

1. Introduction to C programming, Decision Making, Branching, Looping, Arrays & Strings, Functions and Pointers.

2. Algebraic Equation: Iterative Methods – Roots of a Single transcendental equations and roots of Polynomials using Bisection Method, False position Method , Newton Raphson Method.

3. Simultaneous Algebraic Equation :Gauss Elimination Method, Gauss-Jordan Method, Factorization Method, Jacobi's Iteration Method, Gauss- seidal Iteration Method. Matrix Inversion using Gauss Elimination and Gauss Jordan methods. Eigen Value and Eigen Vectors.

4. Interpolations: Newton Methods. Lagrange's Interpolation Formula and difference tables. Least Square Approximations- Linear regression only., Curve Fitting.

5. Differentiation and Integration- Formula for Numerical Differentiation and Numerical integration by Trapezoidal Rule and Simpson's rule only. Numerical Solution of Differential Equation :- Euler's Method, Taylor series Method, Runge Kutta Method.

Readings

1. Numerical Methods by B. S Grewal, Khanna Publishers, Delhi
2. Programming in ANSI C by E. Balguruswamy, Tata McGraw-Hill Education Pvt. Ltd
3. Numerical Methods By V. Rajaraman, 3rd Edition, Prentice-Hall India Pvt. Ltd.
4. Numerical Methods By S.S. Shastri, 4th edition, 2005,PHI publications.
5. LET US C By Y. Kanetkar, 14th Edition, BPB Publication.
6. Computer Based Numerical and Statistical techniques, P.K.Mittal and Mukesh B.,Galgotia Publication.

MSC-103

Discrete Mathematical Structures

1. **Mathematical Logic** : Notations, Algebra of Propositions & Propositional functions, logical connectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers.**Set Theory**: Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's law Cardinality, relations: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

2. **Boolean Algebra :** Truth values and truth tables, the algebra of propositional functions, boolean algebra of truth values Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.

3. **Groups :** Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups.

4. **Graphs :** Simple Graph, directed graph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems, BFS ,DFS, Dijkastra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.

5. **Matrices :** Addition, subtraction, multiplication, transposes.

Readings:

1. A text book of Discrete Mathematics By Swapan Kumar Sarkar (S. Chand & company Ltd.).
2. Discrete Mathematical structure with Applications to computer science By J.P Trembly & R.P. Manohar.
3. Discrete Mathematics By K.A Ross and C.R.B writht.
4. Discrete Mathematics Structures By Bernard Kohman & Robert C. Bushy.

for computer science

5. Discrete Mathematics By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

MSC-104

Data Structure using C

1. **Introduction to Data Structures**: Definition of Data structure and Abstract data type. Basics of Algorithm. Classification of Data structures: Linear, Non-linear. Arrays: Definition & types of array, Memory representation of one & two dimensional array, Operations on DS. Linked List: Singly Linked list- Operation on it; doubly linked list- Operation on it; Circular linked list - Operation on it.

   Overview of C, loops, Functions: call by value and call by reference, Recursive function.Structure: Structure and applications of Structure in various DS. Pointer and applications of Pointer in dynamic memory allocation.

2. **Stacks, Queues:** Stacks; Array representation of stack; Linked representation of stack; Various polish notation's-Prefix, Postfix, infix; Evaluation of a postfix & Prefix expression; Conversion from one another; Application of stack; Queues; Linked representation of queues; Dqueues; Circular queue; Priority queue.

3. **Trees :**Binary trees; Types of binary tree Representation of binary tree in memory; traversing binary tree; Binary search trees; Searching and inserting in binary search trees; Deleting in a binary search ,tree; AVL search trees and operation on it . B trees: searching, insertion, deletion; Heap.

4. **Graphs :** Terminology & representation; Warshall algorithm; Shortest path; Minimum spanning tree; Kruskal & Dijkstara algorithm; Linked representation of graph; Operation on graph; Traversing a graph.

5. **Searching and Sorting:** Searching algorithm: linear search, binary search; sorting algorithms: Bubble sort, Insertion sort, Selection sort, Quick Sort, Merge sort and Heap sort.

Readings:

1. Programming in C "Yashwant Kanetkar", BPB Publications,Tenth Edition.
2. The C Programming Language "Kemigham and Ritche [Prentice Hall]"
3. Data Structure By Lipshutz, McGraw Hill.
4. Data Structure By Standish, Addison-Wesley.
5. Data structures Through C by G. S. Baluja.

MSC-105

Computer Organization

1. **Number System**: Binary, Octal and Hexadecimal number system, Conversion from one number system to another, Binary arithmetic, Representing negative numbers, BCD codes, ASCII codes, EBCDIC codes, Excess three code, Gray code, Floating point representation, 1's complement and 2's compliment,Arithmetic representation of signed binary numbers, 9's complement and 10's compliment system.

2. **Logic Gates and Boolean Algebra**: Properties and Symbolic Representation Of NOT, AND ,OR,NOR,NAND ,EX-OR,EX – NOR GATES, NOR and NAND GATES as a universal gates, Laws and identities of Boolean algebra, Demorgan's theorem, Use of Boolean algebra for simplification of logic expression, SOP and POS forms, Canonical forms, Maxterm, Minterm, Karnaugh map for 2,3,4 variable.

3. **Combinational and Sequential Circuits:** Multiplexer, De multiplexers, Decoders, Encoders, Half adder, Full adder, Half subtractor, Full subtractor, n-bit adder, Adder-subtractor, Flip flops, Registers, Counters.

4. **CPU Organization and Parallel Processing:** General register organization of C.P.U, Stack organization, Instruction format, Addressing modes, Parallel processing, Pipelining, Arithmetic pipelining, Instruction pipeline, RISC pipeline, Vector processing, Array processor**.**

5. **Memory Organization:** Memory hierarchy, Types of memory, Associative memory, Virtual memory, Cache memory.

Readings:

1.M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

2.Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5d., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.

3.R.P.jain, Modern Digital Electronics, 3ed., Tata McGraw-Hill publishing company limited , New Delhi, 2003.

4.Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill,2002.

5.William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.

6.David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002

MSC-201

Principles of Operating System

1. **Introduction**: Definition, Design Goals, Types, Batch processing, Multi-programming, Real time, Time sharing; Functions of Operating System.

2. **Process Management**: Process states, Process Control block, Schedulers, CPU Scheduling algorithms

3. **Inter process synchronization and communication:** need, Mutual exclusion, semaphore, classical problems in concurrent programming, critical region and conditional critical region, Deadlock Characteristics, prevention, resource allocation graphs.

4. **Memory Management**: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing,

5. **File and Secondary Storage Management**: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management.
   UNIX/ LINUX/ WINDOWS/Android as an example of Operating systems

Readings:

1. Operating System Concepts 6/ed By Silberschatz and Galvin, Addison Wesley.
2. Operating Systems: Internals and Design Principles 5/ed By William Stalling, PHI.
3. Modern operating Systems By Tanenbaum, PHI.
4. Operating System Concepts By Peterson and Silberschatz, Addison Wesley.
5. Operating System Principles By P. B. Hansen, PHI.
6. The UNIX Operating System By K. Christian, John Wiley.

MSC-202

Object Oriented Programming with C++

1. **Principles of OOP:** Procedure oriented Vs Object oriented, OOP paradigm, Features of OOP ,Basic Data types Tokens, Keywords, Constant ,Variables, Operator I/O statements , Structure of C++ program, Arrays, pointers, Object modeling technique (OMT).

2. **Function, Object and Class:** Defining class, Abstract class ,Function prototype, Function with parameter ,Passing object as a parameter, Constructor function ,Types of constructor, Destructor Friend function , Friend class, Dynamic allocation operator new and delete.

3. **Polymorphism and Inheritance:** Types of polymorphism, Constructor overloading ,Operator overloading, Template function Template class, Types of inheritance ,Private ,protected and public derivation of class ,Resolving ambiguity Pointer to object, This pointer ,Virtual class , virtual function.

4. **Input - output and File handling:** I/O classes ,File and stream classes ,Opening and closing file Detecting end of file, String I/O**,** Char I/O, Object I/O, I/O with multiple object ,File pointer, Disk I/O**.**

5. **Exception handling, Name spaces and Standard Template library (STL):** Need of Exception handling ,try ,catch and throws keywords , defining namespace ,benefit of namespace, Component of STL.

Readings:

1. Object oriented programming with C++ by E.Balagurusamy II nd edition Tata Mc-Graw Hill.
2. Object Oriented Programmin By McGregor and Sykes S A, 1992 Van Nostrand.
3. The C++ Programming Language By Strustrp B,Addision Wasley.
4. Object Oriented Programming in C++ By Lafore R, Galgotia Publications.
5. Introduction to Object Oriented Programming By Witt KV, Galgotia Publications.
6. Object Oriented Programming By Blaschek G, Springer Verlag

MSC-203

Theory of Computation

1 **Theory of Automata:** Definition of an automaton, Transition system, Acceptability of a string by FA, Nondeterministic finite state machine, Designing of DFA and NFA ,Equivalence of DFA and NFA, Conversion of NFA to DFA, Minimization of finite automata, Mealy and Moore models, Minimization of finite automata.

2 **Formal Languages, Regular Sets and Regular Grammars:** Definition, Languages and their relation, Chomsky classification of language, Regular expression, and Finite automaton, Pumping Lemma for regular sets, Application of Pumping lemma, Closure property of regular sets, Regular sets and regular grammar.

3 **Context-free Language**: Context fee language and derivation trees, Ambiguity in context free languages, Simplification of context free languages: (left recursion, Unit production elimination, Eliminating null values) Normal forms of context free languages.

4 **Pushdown Automation**: Definition, Acceptance by PDA, Designing PDA, Push down automation and Context free languages, Parsing and Pushdown automata.

5 **Turing Machine:** Turing Machines model, Representation of TM, Languages acceptability by TM, Design of TM, Introduction: Universal Turing Machines and Halting problem, Introduction: Linear bounded automata and languages.

Readings:

1. K L P Mishra "Theory of Computation",3rd Edition PHI Publication.
2. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003
3. G.PSaradhiVarma and B. ThirupathiRao , " Theory and Computation Formal Languages and Automata Theory",2005, SCITECH publication.
4. H.R.Lewis and C.H.Papadimitriou, "Elements of The theory of Computation", Second Edition, Pearson Education/PHI, 2003
5. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2003.

MSC-204 ELECTIVE-I (1)

Computer Networks

1. **Introduction and Physical Layer :Introduction:** Goal and application Network Hardware and Software, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode .

   Physical Layer :Data and signal, Analog and digital Communication, Transmission Media ,Concept of data transmission, Switching Techniques ,Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM.

2. **Data Link Layer :** Data Link Layer design issues Data link control:Framing, Flow control. Error Detection and Correction. DLC protocol :Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel, Medium access sublayer: Channel allocation :static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet : SLIP,PPP. Wired and Wireless LAN protocol.

3. **Network Layer :** The Network Layer Design Issue, IP addressing, Address mapping, Error reporting ,Multicasting ,Delivery, Forwarding and Routing. The Network Layer in the Internet : The IP Protocol. subnets, Internet control protocols ,internet multicasting.

4. **Transport Layer :**The Transport layer services, The concept of client and server in terms of socket addressing Quality of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.

5. **Presentation and Application Layer :** Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS ,SNMP,E-mail, application layer protocols.

Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.
2. Computer Networks By A.S. Tanenbaum
3. Computer Network By S.S.Shinde ,New Age International Publisher.
4. Data and computer Communication by Shashi banzal ,Firewall media
5. Internetworking with TCP/IP :Principles,protocols,and Architecture Vol 1 5th Edition ,PHI publication
6. Data Communications and Computer Network by Prakash C Gupta, PHI Publication.

MSC-204 ELECTIVE-I (2)

System Analysis and Design

1. System definition, Need for system development, Types of system, Types of user, System development strategies, SDLC, Feasibility study, Structured Analysis, Development Strategies, Physical and Logical DFD, Data Dictionary, System Prototype Method, Role of system analyst, System investigation :- Fact Finding Techniques, Tools for Documenting Procedure & Decision :Decision Tree, Decision Table, Structured English. Academic and personal qualification of a system analyst, the multifaceted role of the system analyst.

2. Cost benefit analysis: cost and benefits determination. The system proposal. File structure, file organization: sequential organization, indexed sequential organization, inverted list organization. Direct access organization. Database design: Objectives of database and role of database administrator.

3. Introduction to UML, OO Development Life cycle and Modelling, static and Dynamic modelling, Comparison of OO and Module-Oriented Approach, Modelling using UML.

4. System Implementation (System Testing & Quality Assurance) - Introduction, the Test Plan, Quality Assurance, Levels of Quality Assurance, Role of Data Processing Auditor.

5. Software Documentation- Requirement Documentation, Architecture/Design Documentation, Technical Documentation, User Documentation, Marketing Documentation, Documentation Standard, Online Documentation

Readings:

1. Edward," System Analysis & Design ", Tata McGraw Hill, ISBN:8120317270
2. James, A.S, Analysis and design of information systems, Mc Graw hill, New York, 1997
3. 'A' Level *made simple* Structured System Analysis and Design, BPB publications: Dr.Madhulika Jain, Vineeta Pillai, Shashi Singh, Satish Jain
4. Effective Methods for Software Testing, William E. Perry
5. Venkata Rao,v., System Analysis, design & MIS,BPB publications, 2000
6. Awad, Elias., analysis and design, Galgotia publications pvt.Ltd.1998

MSC-204 ELECTIVE-I (3)

Introduction to Microprocessor

1. Introduction, Overview of microcomputer systems, General operation of a microcomputer, Microprocessor : their emergence from 8-bit, Decoder, encoders, Latches, Flipflops, Multiplexer, Demultiplexer.

2. Microprocessor History, 8085 Architecture and Register organization, Functional Block Diagram, Bus Organization, 8085 Instruction Set, Instruction classifications, Instruction word size, Instruction format, Addressing modes, Assembly Language programming,

3. Memory, I/O devices, Addressing memory and I/O devices, Memory mapping, Memory Interfacing, TriState Devices, Buffers.

4. Programming techniques with additional instructions: Looping, Counting, Indexing, Introduction to Advanced Instructions, Instruction cycle, Machine cycle, Timing Diagram, Stack and subroutine, Counter and Time delay, Debugging.

5. Interfacing Chips: 8255A (PPI), 8155 (Multipurpose Programmable Device), Interrupts, 8259A (PIC), Serial I/O and Data communication, Serial Data communication standard (RS 232C) 8257 or 8237A (DMA Controller), 8251A (USART). 16 bit processor 8086: Introduction, Architecture, Pin Diagram, Min & Max Mode, Addressing Modes.

Readings:

1. .Ramesh S. Gaonkar, ―Microprocessor Architecture, Programming and Application with 8085‖, 5th edition, Penram International Publishing (India) Pvt. Ltd.
2. .D V Hall, ―Microprocessor & Interfacing‖ McGraw Hill Education India
3. A. P. Mathur , ―Introduction to Microprocessor‖ McGraw Hill Education India.
4. B.Ram, ―Fundamentals of Microprocessor and Microcomputer‖ DhanpatRai& Co Publication.
5. P K Ghosh, P R Sridhar, ―0000 to 8085 Introduction to microprocessor to Engineers &Scientists‖Prentice-Hall of India.

MSC-205 ELECTIVE-II (1)

Object Oriented Software Engineering

1. **Software Engineering Paradigms:** Software Development process models. **Project & Process**: Project management, Process & Project metrics. **Fundamental concepts of object oriented programming:** Introduction to the principles of object-oriented programming (classes, objects, messages, encapsulation, inheritance, polymorphism, exception handling, and object-oriented containers). **Object Oriented Analysis:** Object Oriented Analysis, **Analysis Techniques:** Object Modeling, Dynamic Modeling, and Functional Modeling. Adding Operations, Analysis Iteration.

2. **Using UML**: UML Introduction. **Object Modeling Notations**: Basic Concepts. **Structural Diagram:** Class Diagram, Object Diagram, Component Diagram, Deployment Diagram. **Behavioral Diagrams:** Use Case Diagram, Interaction Diagram, Activity Diagram, Statechart Diagram. **Modeling with Objects. System Design, Object Design.**

3. **Object Modeling**: Objectives. **Advanced Modeling Concepts:** Aggregation, Abstract Class, Multiple Inheritance, Generalization and Specialisation, Meta Data and Keys, Integrity Constraints, **Dynamic Model:** Objectives, Events, State and State Diagram, Elements of a State Diagram, Advanced Concepts in Dynamic Modeling, **Functional modeling.**

4. **Patterns:** Benefits of patterns, using patterns during Analysis, using Pattern during Design.

5. **Object mapping with Database:** Objectives, Relational Database Schema for Object Modes, Object Classes to Database Tables, Mapping Associations to Tables, Mapping Generalizations to Tables, Interfacing to Databases.

Readings:

1. Bernd Bruegge & Allen H. Dutoit, "Object-Oriented Software Engineering", 2009.
2. Bertrand Meyer, Object Oriented Software Construction, Prentice-Hall.
3. Grady Booch, James Rumbaugh and Ivar Jacobson, Unified Modeling Language Guide, Addison-Wesley.
4. Ivar Jacobson, "Object-Oriented Software Engineering", Pearson Education, 2009.
5. Stephen R. Schach, "Object-Oriented Classical Software Engineering", Mc Graw Hill, 2010.
6. Yogesh Singh, "Object-Oriented Software Engineering", 2012
7. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005

MSC-205 ELECTIVE-II (2)

Multimedia

1. Introduction to Multimedia System Multimedia elements, Multimedia applications, Global structure, Technologies for Multimedia system. Multimedia: Media & Data Streams Multimedia: media & data streams, Properties, Traditional data stream characteristics, Data stream characteristics for continuous media, Information units.

2. Sound / Audio Sound Concepts, Music: MDI Concepts, MIDI devices, MIDI messages, MIDI software, Speech: Speech generation, Speech Analysis, Speech Transmission. Image And Graphics Digital Image Representation, Image Formats, Graphics Formats, Image Processing: Image Synthesis, Image Analysis, Image Transmission.

3. Video & Animation Basic concepts, Television (Conventional systems, Enhanced definition systems, High Definition system), Computer based Animation.

4. Data Compression Storage space, Coding requirements, Source Entropy & Hybrid coding, Basic compression techniques, Introduction to following compression techniques: JPEG, H.261 (PX64), MPEG ,DVI

5. Optical Storage Media & Retrieval Technologies Basic Technology, Video Disk & other WORMS, CD ROM, CD ROM Extended Architecture, Compact Disk Magneto optical.

Readings:

1. Multimedia System Design By P. K. Andleigh, Kiran Thakrar.

2. Multimedia Computing Communication & Application. By Ralf Steinmetz, & Klaranashtedt. (Pearson Education).

MSC-205 ELECTIVE-II (3)

Linux operating System and Shell Programmming

1. **INTRODUCTION TO LINUX:** History, The Linux Architecture, Features of Linux, Internal and External Commands, Command Structure, difference between Linux and Unix, various Linux distributions, basic commands.**UTILITIES:** file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands. The vi editor, security by file Permissions.

2. **INTRODUCTION TO SHELLS:** Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization. Filters. **GREP:** Operation, grep Family, Searching for File Content. **SED:** Scripts, Operation, Addresses, commands, Applications. **AWK:** Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications.

3. **INTERACTIVE KORN SHELL:** Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process. **KORN SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

4. **INTERACTIVE C SHELL:** C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts. **C SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

5. **FILE MANAGEMENT:** File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

Readings:

1. Sumitabha Das, "Unix Concepts and Applications", 4thEdition. TMH, 2006. (1, 2 units)
2. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1stEdition, Cengage Learning India, 2003.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.
4. Graham Glass, King Ables, "Unix for programmers and users", 3rd Edition, Pearson Education, 2009.
5. N.B Venkateswarlu, "Advanced Unix programming", 2ndEdition, BS Publications, 2010.
6. Yashwanth Kanitkar," Unix Shell programming", 1stEdition, BPB Publisher, 2010.
7.Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

MSC-301

Probability and Statistics

1. **Descriptive measures** : Frequency distribution, mean, median, mode, standard deviation, moments, skewness and kurtosis, **Probability:** Definitions of Probability, Addition Theorem, Conditional Probability, Multiplication Theorem, Bayes' Theorem of Probability.

2. **Random Variables and their Properties:** Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Covariance.

3. **Probability Distributions:** Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and their Properties; Continuous Distributions : Uniform, Normal, Exponential Distributions and their Properties.

4. **Multivariate Analysis and Curve Fitting**: Correlation, Correlation Coefficient, Rank Correlation, Linear Regression, Multiple Regression, Principles of Least Squares and Curve Fitting

5. **Estimation and testing of hypothesis**: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-Biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. Small Sample Tests. Large Sample Tests.

Readings:

1. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2002
2. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
3. Probability, Statistics and Random Processes, T.Veerarajan Tata McGraw – Hill
4. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

MSC -302

Artificial Intelligence

1. **Introduction:** Definitions and approaches, Foundation of A.I. , Challenges in AI, Area and Applications of A.I., Intelligent Agents: meaning, types, environments, examples.

2. **Problem Solving:** Problem solving as state space search, production system, writing production system and solution for a Water jug problem; some AI classical problems (statements only) cannibal missionaries, tower of Hanoi, tic tac toe, 8-puzzle, Search techniques: Breadth First, and Depth-first, Best-First Search, Hill-climbing, Heuristics, A* algorithm, local and global maxima(minima),

3. **Knowledge Representation and Reasoning**: Predicate and prepositional logic, conversion of sentences to wffs of predicate logic, Resolution, clause form, Skolem functions, Unification, Resolution in Propositional and predicate logic, Semantic Nets.

4. **Pattern Recognition:** Meaning of pattern, Pattern Recognition, Classification, Supervised & Unsupervised Learning of classifiers, K-NN, K-MEANS algorithms.

5. **Expert Systems:** Introduction, Advantages, components and participants in an expert system, Application

Readings:

1. Artificial Intelligence: E. Rich and K. Knight, Tata McGraw Hill.
2. Artificial Intelligence: A New Synthesis By Nilsson, Morgan Kaufmann.
3. Pattern Classification 2nd Edition By R.O. Duda, Hart, Stork (2001) ,John wiley, New York.
4. Pattern Recognition : Technique and Applications By Shinghal (2006) ,Oxford University Press,New Delhi.

MSC - 303

Relational Data Base Management System

1. **Overview of Database Management** :Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases.

2. **Relational Model :** Entity - Relationship model as a tool for conceptual design-entities attributes and relationships. ER diagrams; Concept of keys: candidate key, primary key, alternate key, foreign key; Strong and weak entities, Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.

3. **Structured Query Language :**Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages, Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.

4. **Relational Database Design :**Normalization concept in logical model; Pitfalls in database design,
   update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, De-normalization.

5. **Introduction to Query Processing and Protecting the Database & Data Organizations :** Parsing, translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL.

Readings:

1. Database system concept By H. Korth and A. Silberschatz, TMH.
2. Data Base Management System By Alexies & Mathews , Vikas publication.
3. Data Base Management System By C. J. Date ,Narosha Pub.
4. Data Base Management System By James Matin .
5. Principles of Database System By Ullman.
6. An Introduction to database systems By Bipin Desai, 2011 ed.,Galgotia Publication.
7. Database Management System By A. K. Majumdar & P.Bhattacharya, TMH

MSC-304 ELECTIVE-III (1)

Advanced Java Programming

1. **Basics of Core JAVA:** class, interface, exception handling.**Collections :** Collection Interfaces, Concrete Collections, The Collections Framework **Multithreading :** Creating thread and running it, Multiple Thread acting on single object,Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread.

2. **Networking:**Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams.**Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.

3. **Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, HandlingHTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession

4. **Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries, **Enterprise Java Bean:** Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties,Types of beans, Stateful Session bean, Stateless Session bean, Entity bean

5. **Remote Method Invocation:** Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client, **Struts:** Basics of Struts,Struts : What and Why? ,Model1 vs Model2 ,Struts2 Features, Steps to create Struts application ,Understanding Action class ,Understanding struts.xml file

Readings:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves – Apress publication

MSC-304 ELECTIVE-III (2)

System Software

1. **Basic Concepts:** Software, System Software, Types of system software, SIC (Simplified Instructional Computer), SIC/XE, Simple programs for SIC and SIC/XE
   .
2. **Assemblers:** Assembler functions, M/C dependent assembler features, M/C independent assembler features, One-pass assembler, Multi-pass assembler, Implementation example- MASM assembler.

3. **Loaders and Linkers:** Introduction, Basic loader function, Machine dependent loader features, machine independent loader features, Loader design option.

4. **Macro processors:** Macro definition and expansion, Macro processor algorithm and data structure, Independent macro processor features, Macro processor design option.

5. **System software tools:** Software tools for program development, Editors, Debugging, Programming environment, User Interface.

Readings:

1 Leland L. Beck, System software-An Introduction to System Programming, 3rd Edition, Pearson Education, Asia, 2006.
2 D. M. Dhamdhere, System Programming & Operating Systems, Tata Mc Graw Hill, Second Revised Edition, 1999.
3 J. Donovan, Systems Programming: An Introduction to System Programming, Tata Mc Graw Hill Publication,Edition, 1999.
4 A. C. Shalini, System Software, Scitech Publications (INDIA) PVT, LTD, Fifth Reprint, 2010.

MSC-304 ELECTIVE-III (3)

Neural Network

1. **Introduction:** What is a neural network, benefits, model of a simple neuron, various components and their meaning used in the simple model of an artificial neuron

2. **Models of Neural Networks:** Single layer, multi layer perceptrons, types of transfer functions, recurrent networks , calculation of output in forward propagation in these networks, linearity and nonlinearity in models,

3. **Supervised and Back Propagation Networks:** Meaning of supervised learning with examples, Learning rules, errors and their calculations, learning in a neural network, training and testing of a neural network in prediction for single layer only, local mimima, momentum, over-fitting in neural networks

4. **Unsupervised learning:** Meaning of supervised learning with examples and applications, learning with a teacher, Self Organized Feature Maps (SOFM), Kohonen Network learning and their examples

5. **Applications**: Neural Networks and their applications in classification, prediction, identification

Readings:

1. Neural Networks: A Comprehensive Foundation: Simon Haykin, Prentice Hall [2001 or later]
2. Neural Network Design: Hagan, Demuth, Beale, Thomson Learning, [2001 or later]
3. Introduction to Neural Networks Using MATLAB 6.0: Sivanadam, Sumathi, Deepa, The McGraw Hill [2006 or later]

MSC-305 ELECTIVE-IV (1)

Web Technology

1 **Internet Concept**: Fundamental of Web ,History of Web, Web development overview, Domain Name System (DNS),DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture ,Web Browser and Web Server.

2. **HTML and DHTML:-** HTML Tag, Rules of HTML, Text Formatting and Style, List, Adding Graphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class and DIV, External Style Sheet.

3. **Scripting Languages:** Java Script (JS) in Web Page, Advantage of Java Script, JS object model and hierarchy ,Handling event, Operators and syntax of JS, JS Function, Client side JS Vs Server side JS ,JS security, Introduction to VB Script, Operator and Syntax of VB Script, Dialog Boxes, Control and Loop, Function in VBS.

4. **XML:**Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitive advantage with XML, Programming in XML, XML Schema ,XSLT ,DOM structure model ,XML quires and transformation.

5. **Active Server Page (ASP):** Introduction ,Internet Information System (IIS),ASP object ,Server object, File system object, session ,Accessing data base with an ASP page ,ODBC – ADO connection object, common methods and properties, ADO record set object .Introduction to ASP.Net.

Readings:

1. The complete Reference By Thomos A. Powell ,TMH publication
2. Web Technology :A Developers Perspective ,N.P.Gopalan ,J.Akilandeswani,PHI Publication.
3. Java Script :The definite Guide By Flangam , O'Reilly
4. Java Script :Developers Resource by Kamran Husain and Jason Levitt PTR-PHI publication.
5."Mastering VB Script" BPB Publication.
6.World Wide Web design with HTML by Xavier Tata McGraw Hill Publication .
7. XML By Example, Sean Mc Grath Pentice Hall Publication.
8. Web Technology : A Developments Perspective , N.P. Gopalan, J. Akilandeswari, PHI Publication

MSC -305 ELECTIVE –IV (2)

Pattern Recognition

1. **Pattern Concept:** Meaning of pattern, examples of patterns, importance of study of patterns in machine learning, meaning of labels, attributes, features, dimensions in patters with examples, pattern recognition and classification, meaning of machine learning

2. **Pattern Recognition and classification:** Meaning and importance in machine learning, supervised and unsupervised learning with meaning and examples, classifiers, k-nn classification and k-means clustering, implementation and applications

3. **Decision Trees:** Meaning of tree and hence decision tree, building a decision tree, decision tree induction, classification using a decision tree, classification using ID3

4. **Evolutionary Computing:** Meaning of evolutionary computing, various operators used in evolutionary computing, genetic algorithms and their applications, Particle Swarm Optimization and their applications, Multi-objective Genetic Algorithms with examples

5. **Ensemble of classifiers:** Meaning and importance of ensembles, boosting and AdaBoost algorithm, bagging and random forest, weak and strong learning, ensembles of classifiers with voting

Readings:

1. Pattern Classification: Duda, R.O, Peter Hart, David Stork, 2010, Wiley India
2. Data Mining: Concept and Techniques, Morgan and Kaufmann, 2001
3. Pattern Recognition: Rajjan Shinghal, Oxford University Press New Delhi, 2006
4. Ensemble Methods, Foundations and Algorithms, Zhi-Hua Zhou, A CRC Press, Chapman and Hall Book, 2010
5. Pattern Recognition, Robi Polikar, Wiley Encyclopedia of Biomedical Engineering, 2006 John Wiley & Sons, Inc

MSC-305 ELECTIVE-IV (3)

Compiler Design

1. **Basics of Compilers and Lexical Analysis:** Compilers and Translators, Bootstrap compiler, Phases of Compiler, Compiler writing tools, Bootstrapping, Overview of one pass compiler, Finite Automation, Basics of DFA, NFA, Regular sets and Regular expressions.

2. **Syntax analysis & Parsing techniques:** Basics of context free grammars and derivation of parse trees, Top down parsing and its implementation, Operator precedence parsing, Predicative top down parser, Bottom up parsing, Handel of right sentential form, LR parser, Canonical collection of sets, Construction of parsing action and GOTO table, Construction of LALR parsing table, Handling ambiguous grammar.

3. **Syntax directed definition and Translation**: L-attributed definition, Syntax directed translation scheme, Intermediate code generation**,** Representing three address statements, Syntax directed translation scheme to specify the translation of various programming language construct, Implementing increment and decrement operators, Array reference, Switch/case.

4. **Symbol table management & Error Handling**: Various approaches to symbol table organization, Representation of scope information in symbol table, Storage allocation activation of procedure and record, Static allocation and stack allocation. Error recovery, Error recovery in LR parsing, Predicative parsing error recovery.

5. **Code Optimization and Code Generation** : Introduction, Loop optimization, Eliminating induction variable, Eliminating local common sub expression, DAG, Eliminating global common sub expression, loop unrolling, loop jamming, Problems hindering code generation, Straight forward code generation, Using DAG for code generation, Peephole optimization.

Readings:

1.Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman. "Compilers Principles, Techniques and Tools". Pearson Education,2008.

2.O.G.Kakde, "Compiler Design", 2005, Laxmi Publication.

3. AdeshK.Pandey" Concepts of Compiler Design ", First Edition, S.K.Kataria& Sons Publication.

4.Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman,1997. 5.AllenHolub, "Compiler Design in C", Prentice Hall of India, 1990.

GUIDELINES FOR PROJECT WORK (MSC)

A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are:

Number of Copies:

The student should submit One hardbound copy of the Project Report with one RW/CD/DVD.

Acceptance / Rejection of Project Report:

The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.

Format of the Project Report :

The student must adhere strictly to the following format for the submission of the Project Report **a. Paper**

The Report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The Report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.

b. Typing

The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.

c. Margins

The typing must be done in the following margins

Left ----- 35mm, Right ----- 20mm

Top ----- 35mm, Bottom ----- 20mm

d. Binding

The Report shall be Rexene bound in black. Plastic and spiral bound Project Reports not be accepted. **e. Front Cover:**

The front cover should contain the following details:

TOP : The title in block capitals of 6mm to 15mm letters.

CENTER : Full name in block capitals of 6mm to 10mm letters.

BOTTOM : Name of the University, year of submission- all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centering. **f. Blank Sheets**

At the beginning and end of the report , two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

Abstract

Every report should have an Abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.

The report should contain the following:

Certificate from Company

Institute Certificate: Successful completion of project by competent authority.

Acknowledgments

Abstract

List of Figures

Tables

Nomenclature and Abbreviations

Contents of the Project Report

1. Company Profile (only for M.I.S. projects)
2. Introduction to the project
3. Scope of work.
4. Existing System and Need for System.
5. Operating Environment - Hardware and Software.
6. Proposed System.
- **6.1** Objectives to be fulfilled
- **6.2** User Requirements
- **6.3** Requirements Determination Techniques and Systems Analysis Methods Employed.
- **6.4** Prototyping.
- **6.5** System Features
  - -Design of Input
  - -Design of Output screens and reports -Module specifications
  - -D.F.D.'s and ER's -
    System flow charts -
    Data Dictionary -
    Structure charts -
    Database /File layouts
    -User Interfaces -
    Coding system
  - -Design of Control Procedures -
    Design of Exception Handling

7. Testing procedures and Implementation Phases
8. Acceptance Procedure
9. Post-Implementation Review
10. User Manual
- Menu explanation
  -User guide
- -Expected problems/errors and their solutions

11. Problems encountered
12. Drawbacks and Limitations
13. Proposed Enhancements
14. Conclusions
15. Bibliography

Annexure:

- -Sample documents (manual or computer generated) -Source code listing in a separate file
- -Output reports

List of Tables:

The Contents shall be followed by a 'List of Tables' indicating the table number, table title and the corresponding page number(s).The table number shall be in decimal point notation indicating the chapter number and the table number in that chapter.

NOTE : Any reference within the text shall be given by quoting relevant number.eg: 'Table5.2'

List of Figures:

The 'List of Figures, shall follow the 'List of Tables' indicating the figure numbers, figure titles and corresponding page number. The figure numbers shall be in decimal point notation.

Nomenclature and Abbreviations:

The 'Nomenclature and Abbreviations' shall follow the 'List of Figures' and contain the list of symbols and abbreviations and their long names used. The nomenclature should be given for ER's, DFD's, STRUCTURED CHARTS, and RUN CHARTS and for all other symbols in the techniques used. The nomenclature for every technique should appear on a separate sheet. As far as possible, accepted standard symbols shall be used.

Chapter Numbering:

The Chapters shall be numbered in Arabic numerals. Section and subsections of any chapters shall be in decimal notation. All chapters shall begin on a new page. The titles for the chapters and the title shall be properly centered at the top of the page and have three spaces between them.

Company Profile:

This chapter should highlight the company details. This would be chapter 1 and should include the main stream activity of the company, the product line of the company and the details of the department where the student was working. This should not exceed two pages or 800 words.

N.B. : Only relevant for M.I.S. Projects.

Introduction:

The 'Introduction' shall highlight the purpose of project work It will also define the chapters to be followed in the Project Report.

Existing System and the Need for the System:

If there is some system already in use, then a brief detail of it must be included, to help the examiner understand the enhancements carried out by6 the student in the existing system. Based on this, the student should exemplify the need for the computerization should be given.

N.B. : Only where relevant.

Proposed System :

1. Objectives : Clearly define the objective(s) of the system in a few lines.

2. User Requirements : State the requirements of the use in an unambiguous manner.

3. Requirements Determination Techniques and System Analysis Methods Employed:

Use the formal methods to describe the requirements of the use. Like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.

4. Prototyping : If the prototypes has been developed prior to the detailed design , then give details of the prototype.

5. System Features :

5.1 Design of Input :Inputs, Data Dictionary, Screens.

5.2 Design of Output :Outputs, Reports etc.

5.3 Design of Control Procedures : Structured charts, Module Specifications, Run charts etc.

5.4 Design of Exception Handling: Error handling and recovery procedures.

The choice of including topics in this chapter entirely depends on the student. The freedom given for this chapter is obvious.

Students will be working on various types of projects. A typical M.I.S. development project must include DFD's and structured charts etc. Thus a student is allowed to employ the techniques of his/her own choice suitable to his/her work. However, there is a guideline that the student must employ the techniques taught during the MSC course.