Department of Computer Science & Information Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
SYLLABUS FOR <u>M.Sc.-CS</u> COURSE UNDER CHOICE BASED CREDIT SYSTEM (CBCS) *

Session 2015-2016

<u>M.Sc- Computer Science</u>

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	Programming Based Numerical Analysis	4		40	60	4
3	MSC-103	Programming in 'C' Language	4		40	60	4
4	MSC-104	Data Structure	4		40	60	4
5	MSC-105	Computer Organization	4		40	60	4
6	MSC-106	LAB-I:Programming in C		1		100	1
7	MSC-107	LAB-II: Data Structure Using C		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	Discrete Mathematics	4		40	60	4
4	MSC-204	Elective I(Web Technology)	4		40	60	4
5	MSC-205	Elective II(Theory of Computation)	4		40	60	4
6	MSC-206	Lab based on C++		1		100	1
7	MSC-207	Lab Based on Elective-I		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	Programming in JAVA	4		40	60	4
2	MSC-302	Artificial Intelligence and Expert Systems	4		40	60	4
3	MSC-303	Relational Data Base Management System	4		40	60	4
4	MSC-304(Elective-I)	Elective I(Compiler Design)	4		40	60	4
5	MSC-305(Elective-II)	Elective II(Computer Network)	4		40	60	4
6	MSC-306	Lab based on JAVA		1		100	1
7	MSC-307	Lab Based on RDBMS		1		100	1
		Total	20	02	200	500	22

Semester 4

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-401	Major Project	-	-	-	500	15
		Total	-	-	-	-	15

Total Course Credits – 81

Note: Electives to be decided at the start of the respective semester

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
Programming Based Numerical Analysis

1. **Algebraic Equation :**Computer Arithmetic – Floating point Numbers- Operations Normalization and their consequences. Iterative Methods – Roots of a Single transcendental equations and roots of Polynomials using Bisection Method , False position Method , Newton Raphson Method.

2. **Simultaneous Algebraic Equation :**Gauss Elimination Method, Gauss-Jordan Method, Factorization Method, Jacobi's Iteration Method, Gauss- seidal Iteration Method.
   Matrix   Inversion   &   Eigen Value: Gauss Jordan Method,   Factorization Method and Eigen Vectors.

3. **Interpolations:** Polynomials interpolation, Newton Method. Lagrange's Interpolation Formula and difference tables. Least Square Approximations- Linear regression only.

4. **Differentiation and Integration**- Formula for Numerical Differentiation and Numerical integration by Trapezoidal Rule and Simpson's rule only.

5. **Numerical Solution of Differential Equation** :- Euler's Method, Taylor series Method, Runge-Kutta Method.

 Readings:

1. Numerical Methods By V. Rajaraman, 3rd Edition, Prentice-Hall India Pvt. Ltd.
2. Numerical Methods By S.S. Shastri, 4th edition, 2005,PHI publications.
3. Numerical Methods in Engineering and Science, 36th Edition, Khanna Publishers, Delhi.
4. Computer Based Numerical and Statistical techniques, P.K.Mittal and Mukesh B.,Galgotia Publication.

MSC-103

Programming in 'C' Language

1. **Fundamentals of C Programming:** Overview of C, History of 'C', Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables.
   Operators and Expressions: Arithmetic operators, Relational operator, Logical operators, operator precedence and associativity, Type casting, Expressions, Console I/O formatting, Unformatted I/O functions.
   Control Constructs: If-else, switch-case and break, branching statements
   Loops: for, do while, while, Nested loops, break and continue, goto, exit function.

2. **Arrays, Strings and Functions**: **Array:** Numeric and character arrays, Multidimensional arrays.
   String: String manipulation with/without using library function.
   Functions: Call by value and call by reference, Recursive function
   Command line arguments.
   Structure, Union & Enum: Structure: Array of structure, array within structure, Nested structure, passing arguments and returning structure for functions.declaring union and its usage.

3. **Dynamic Data Structures in 'C' - Pointers**: * and & operators. void pointer, pointer to pointer, pointer arithmetic, pointer comparison, Pointers to functions, function returning pointer, passing function as argument to function,Pointer to structure.
   Dynamic memory allocation functions – malloc, calloc, realloc and free.

4. **File Handling and Miscellaneous Features:** Basics**,** file pointer, File accessing Functions, File handling through command line argument**.**
   Introduction to C preprocessor: #include, #define, conditional compilation directives: #if, #else, #elif,#endif, #ifndef etc.

5. **Graphics in C:** Detection, initialization, and loading of graphics driver for the programs. Constant, Data types and global variables used in graphics. Library functions used in drawing, union REGS, General 8086 software interrupts interfaces, int86, int86x, GUI interaction within the program.

Readings:

1. Programming in C "Yashvant Kanetkar", BPB Publications,Tenth Edition.
2. Programming with C "Venugopal", TMHOutline Series,Third Edition.
3. The C Programming Language "Kemigham and Ritche [Prentice Hall]"
4. Programming in C Language, "Dr Amit Saxena" Ananya Publication
5. Programming in C Language "Bala Gurusamy" Fourth Edition
6. Theory and Problems of Programming with C, Byron S. Gottfreid, McGraw-Hill
7. Graphics Under C "Yashvant Kanetkar" BPB Publication

MSC-104

Data Structure

1. **Basics terminologies:** Introduction to basic data Structures: Arrays, linked list, trees, stack, queue, Data structure operations; time complexity, space complexity.

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; De queues; Circular queue; Priority queue;.

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

4. **Trees :**Binary trees; 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; Insertion and deletion in binary search trees; Heap.

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

READINGS:

1. Data Structure By Lipshutz, McGraw Hill.
2. Data Structure By Standish, Addison-Wesley.
3. Data Structures using C By A. M. Tennenbaum, Y. Langsam and M. J. Augenstein,PHI, 1991

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. **Principal 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

Discrete Mathematics

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 wrihht.
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-204

Web Technology (Elective-I)

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-205

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Theory of Computation (Elective-II)

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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, M 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-301

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Programming in JAVA

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1. **Overview of JAVA** : The genesis of java, An overview of java, java virtual machine (JVM) ,Java development kit (JDK) ,Java Vs C++, Data types, Literals, Variables, and Arrays, Operators, Control statements, Introducing Class, closer look at Methods and class ,Nested and inner class ,Exploring Java.lang, String handling ,Constructor ,Garbage collection and finalize() method. Writing simple JAVA program.

2. **Inheritance, Packages and interface-** Types of inheritance ,Access specifier ,using super, method overriding , Abstract class ,constructor in multilevel inheritance ,using final with inheritance ,Dynamic method dispatch , Defining package, CLASSPATH, Access protection ,Importing package ,Defining and implementing interface , Extending interface, Nested interface.

3. **Exception handling and Multithreading:** Using try and catch ,multiple catch classes, Nested try statements , throw ,throws and finally ,Built in exception ,Uncaught exception , Creating own exception class , Java Thread Model: Main thread ,Creating own Thread ,Life cycle of thread, Thread priorities ,Synchronization and messaging, Interthread communication ,Suspending ,Resuming and stopping thread.

4. **Input Output and Networking :**I/O classes: Byte stream and character stream ,Predefined stream ,reading console input, writing consol output,PrintWriter class ,Reading and writing files. **Networking** : classes and interface ,Socket and overview, TCP/IP client socket and server socket ,Inet address ,URL Connection, Datagram.

5 . **Applet ,AWT,Swing, Event handling and Advance JAVA–** Applet life cycle, Creating an applet, Using image and sound in applet ,passing parameter.Exploring AWT and introduction to Swing.Event handling – The delegation-event model , Event classes ,Source of event, Event listener interfaces ,handling mouse and keyboard event ,Adapter class.
Advance JAVA : JDBC API. Servlet – Overview of servelet,Life cycle of servlet, JAVA servlet architecture Generic servlet and http servlet ,The servlet interface, Request and response.

Readings:

1. Java: The complete reference By Naughton P and schildt H. ,Osborne Mcgraw-Hill, Berkeley, USA, 1997.
2. Simply JAVA :An Introduction to JAVA programming By James R. Levenick ,Firewall Media publication New,Delhi
3. Java Programming By E.Balguruswami
4. Core JAVA for beginners By Rashmi Kanta Das ,Vikas Publication.
5. Core JAVA : A Comprehensive Study by Mahesh P. Matha , PHI publication.

MSC -302

Artificial Intelligence and Expert Systems

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

RDBMS

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

Compiler Design (Elective-I)

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.

MSC 305

Computer Networks (Elective-II)

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- 401

Major Project
MAJOR PROJECT

List of Electives

1. Theory of Computations
2. Web Technologies
3. Discrete Mathematics
4. Software Engineering
5. Communication Skills
6. Data Communication And Computer Networks
7. Visual basic .Net programming
8. Linux Operating System
9. Natural Language Processing
10. C# Programming
11. PHP based WEB Designing
12. Mainframe Software
13. E Commerce
14. Image Processing
15. Financial Accounting
16. Data Warehousing and BIG DATA
17. Introduction to Parallel Processing

GUIDELINES FOR PROJECT WORK (M.Sc.)

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 centred 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.