Syllabus and Scheme of Examinations
Master of Science (Computer Science) - Regular
w.e.f. from 2016-17

M.Sc.(Computer Science) First Year

First Semester

Paper Code (HC/SC/FE/OE)	Nomenclature	Max. Marks (E+I)	Credits (L:T:P)
M.Sc.-101(HC)	Discrete Mathematics	100 (80+20)	4:0:0
M.Sc.-102(HC)	Computer Fundamentals and Programming in C	100 (80+20)	4:0:0
M.Sc.-103(HC)	Data Base Management Systems	100 (80+20)	4:0:0
M.Sc.-104(HC)	Computer Organization and Architecture	100 (80+20)	4:0:0
M.Sc.-105(HC)	Practical-I (Based on M.Sc.-102 & M.Sc.-103)	100 (80+20)	0:0:4
			Total Credits=20

Total Credits : 20

Second Semester

Paper Code (HC/SC/FE/OE)	Nomenclature	Max. Marks (E+I)	Credits (L:T:P)
M.Sc.-201(HC)	Data Structures Using C	100 (80+20)	4:0:0
M.Sc.-202(HC)	Object Oriented Programming Using C++	100 (80+20)	4:0:0
M.Sc.-203(HC)	Software Engineering	100 (80+20)	4:0:0
M.Sc.-204(HC)	Computer Networks	100 (80+20)	4:0:0
M.Sc.-205(HC)	Practical-II (Based on M.Sc.-201 & 202)	100 (80+20)	0:0:4
			Total Credits=20
Foundation Elective			
To be Chosen from the pool of Foundation Electives provided by the university.			2 Credits
Open Elective			
To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)			3 Credits

Total Credits : 25

M.Sc.(Computer Science) Second Year

Third Semester

Paper Code (HC/SC/FE/OE)	Nomenclature	Credits (L:T:P)	Max. Marks (E+I)
M.Sc.-301(SC)	i) Compiler Design ii) Computer Security iii) Computer Graphics	4:0:0	100 (80+20)
M.Sc.-302(SC)	i) Management Information System ii) Digital Image Processing iii) Artificial Intelligence	4:0:0	100 (80+20)
M.Sc.-303(HC)	Operating System and Unix	4:0:0	100 (80+20)
M.Sc.-304(HC)	Visual Programming	4:0:0	100 (80+20)
M.Sc.-305(HC)	Practical-III (Based on M.Sc.-303, M.Sc.-304 and M.Sc.-301 – only practical subjects)	0:0:4	100 (80+20)
		Total Credits=20	
Open Elective			
To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)			3 Credits

Total Credits : 23

Fourth Semester

Paper Code (HC/SC/FE/OE)	Nomenclature	Credits (L:T:P)	Max. Marks (E+I)
M.Sc.-401(HC)	Java Programming	4:0:0	100 (80+20)
M.Sc.-402(SC)	i) Data Warehouse and Data Mining ii) Analysis and Design of Algorithms iii) Multimedia and Its Applications	4:0:0	100 (80+20)
M.Sc.-403(SC)	i) Internet and Web Designing ii) Software Testing iii) Advances in Database Systems	4:0:0	100 (80+20)
M.Sc.-404(SC)	Practical-IV (Based on M.Sc.-401)	0:0:4	100 (80+20)
M.Sc.-405(HC)	Project Report	0:4:0	100 (80+20)
		Total Credits=20	

Overall Credits : 88

M.Sc.(Computer Science) First Year

FIRST SEMESTER

DISCRETE MATHEMATICS
PAPER CODE: M.Sc.-101

External Marks: 80
Internal Marks: 20

Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.
Relations and functions: Properties of Relations, Equivalence Relation, Partial Order Relation, Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

UNIT – II

Propositional Logic: Proposition logic, basic logic, Logical Connectives, truth tables, tautologies, contradiction, Logical implication, Logical equivalence, Normal forms, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers. Mathematical Induction.

UNIT – III

Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint and Inverse of a matrix.
Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Solving a system of linear equations.

UNIT – IV

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions.
Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, FA with output: Moore machine, Mealy machine.

SUGGESTED READINGS

1. C.L.Liu: Elements of Discrete Mathematics, McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
6. Doerr Alan & Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.

COMPUTER FUNDAMENTALS AND PROGRAMMING IN C
PAPER CODE: M.Sc.-102

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Unit-I

Computer Fundamentals: Concept of data and information; Components of Computer: Hardware Input Device, Output Device. CPU: Components of CPU; Memory and Storage Devices; Computer Software: System Software and Application Software; Functions of Operating System. Programming Languages: Machine, Assembly, High Level Language, 4GL; Language Translator; Linker, Loader; Classification of Computers: Micro, Mini, Mainframe, Super computer. Advantages of Computer, Limitations of Computer, Range of Applications of Computer, Social concerns of Computer Technology: Positive and Negative Impacts, Computer Crimes, Viruses and their remedial solutions.

Unit-II

Problem Solving: Problem Identification, Analysis, Flowcharts, Decision Tables, Pseudo codes and algorithms, Program Coding, Program Testing and Execution.

C Programming Fundamentals: Keywords, Variables and Constants, Structure of a C program. Operators & Expressions: Arithmetic, Unary, Logical, Bit-wise, Assignment & Conditional Operators, Library Functions, Control Statements: Looping using while, do…while, for statements, Nested loops; decision making using if…else, Else If Ladder; Switch, break, Continue and Goto statements.

Unit-III

Arrays & Functions: Declaration and Initialization; Multidimensional Arrays. String: Operations of Strings; Functions: Defining & Accessing User defined functions, Function Prototype, Passing Arguments, Passing array as argument, Recursion, Use of Library Functions; Macro vs. Functions.

Pointers: Declarations, Operations on Pointers, Passing to a function, Pointers & Arrays, Array of Pointers, Array accessing through pointers, Pointer to functions, Function returning pointers, Dynamic Memory Allocations.

Unit-IV

Structures and Union: Defining and Initializing Structure, Array within Structure, Array of Structure, Nesting of Structure, Pointer to Structure, Passing structure and its pointer to Functions; Unions: Introduction to Unions and its Utilities.

Files Handing: Opening and closing file in C; Create, Read and Write data to a file; Modes of Files, Operations on file using C Library Functions; Working with Command Line Arguments. Program Debugging and types of errors.

Suggested Readings

1. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

2. Kenneth.A.: C problem solving and programming, Prentice Hall.
3. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
4. Gill, Nasib Singh: Handbook of Computers, Khanna Books Publishing Co., New Delhi.
5. Sanders, D.: Computers Today, Tata McGraw-Hill.
6. Rajender Singh Chhillar: Application of IT to Business, Ramesh Publishers, Jaipur.
7. Cooper, Mullish :The spirit of C, An Introduction to Modern Programming, Jaico Publ. House, New Delhi.
8. Kerninghan & Ritchie: The C Programming Language, PHI.
9. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
10. E. Balaguruswamy: Programming in C, Tata McGraw Hill.
11. H. Schildt: C-The Complete Reference, Tata McGraw Hill.
12. Y. Kanetkar: Let us C, BPB Publication

Note: Latest and additional good books may be suggested and added from time to time.

DATA BASE MANAGEMENT SYSTEMS
PAPER CODE: M.Sc.-103

External: 80 **Times: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: Characteristics of database approach, data models, DBMS architecture and data independence.

E-R Modeling: Entity types, Entity set, attribute and key, Relationships, Relation types, Roles and Structural constraints, Weak entities, Enhanced ER Model.

Database Languages: DDL, DML, Database Access for applications Programs, Database Users and Administrator, Transaction Management, Database system Structure, Storage Manager, Query Processor.

UNIT-II

Relational Model: Introduction to the Relational Model, Integrity Constraint over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to views, Destroying/altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra, Set operations, Selection and projection, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus: Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and Calculus.

UNIT-III

Schema Refinement, Functional dependencies: Problems Caused by redundancy, Decompositions, Problem related to decomposition, Normalization : FIRST, SECOND, THIRD Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies, forth Normal Form.

Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Serializability and recoverability.

UNIT-IV

Concurrency Control: Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Concurrency without Locking, Recovery Techniques, Database Security.

Introduction to Oracle : Getting started, Modules of Oracle, Invoking SQLPLUS, Data types, Data Constraints, Operators, Data manipulation - Create, Modify, Insert, Delete and Update; Searching, Matching and Oracle Functions.

SQL* Forms: Basic concepts, Form Construction, Creating default form, user-defined form, multiple-record form, Master-detail form.

Suggested Readings :

1. Raghurama Krishnan : Data base Management Systems, Johannes Gehrke, Tata McGraw Hill.
2. Siberschatz, Korth : Data base System Concepts, McGraw Hill.
3. P. Radha Krishna : Database Management Systems, HI-TECH Publications.
4. C.J. Date : Introduction to Database Systems, Pearson Education.
5. Rob & Coronel : Data base Systems design, Implementation, and Management,Thomson.
6. Elmasri Navrate : Data base Management System, Pearson Education.
7. Mathew Leon : Data base Management System, Leon Vikas Publishers.
8. Connoley : Data base Systems, Pearson Education.

Any other book(s) covering the contents of the paper in more depth.
Note : Latest and additional good books may be suggested and added from time to time.

COMPUTER ORGANISATION AND ARCHITECTURE
PAPER CODE: M.Sc.-104

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Representation of Information: Number Systems: Binary, Octal and Hexadecimal, Integer and Floating-point representation, Character codes: ASCII and EBCDIC.

Basic Building Blocks and Circuit Design: Boolean Algebra and Logic Gates: OR, AND, NOT, XOR Gates; De Morgan's theorem; Universal building blocks; Simplifying logic circuits : sum of product and product of sum form; Karnaugh Map simplification; Combinational logic blocks (Adders, Multiplexers, Encoders, Decoder), Sequential logic blocks (Latches, Flip-Flops, Registers, Counters).

UNIT-II

Register transfer and Micro-operations: Register Transfer Language; Bus and memory Transfer; Micro operations: Arithmetic, Logic & Shift Micro operations.

Basic Computer Organization and Design: Instructions Codes, Register reference, Memory Reference & Input-Output instructions, Instruction Cycle, Timing and Control, Interrupts; Design of Control unit: Hardwired control unit, Micro-programmed control unit.

UNIT-III

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory.

Register Organization and Parallel Processing: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes; Data Transfer & Manipulation Instructions, CISC and RISC: Features and Comparison**,** Pipeline and Vector Processing: Parallel processing, Pipelining, Arithmetic Pipeline, Instruction pipeline and Arrays Processors.

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-Output interface, Asynchronous Data Transfer, Modes of transfer, Priority interrupt, Direct Memory Access (DMA), input-output processors (IOP), Serial communication. Multi-processors, characteristics of multi-processors, Interconnection structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.

Suggested Readings

1. Mano, M.M. : Digital Logic and Computer Design, Prentice- Hall of India.
2. Gill Nasib Singh and Dixit J.B.: Digital Design and Computer Organization, University Science Press (Laxmi Publications), New Delhi.
3. Mano, M.M. : Digital Design, Prentice-Hall of India.
4. Anand Kumar : Fundamentals of Digital Circuits, PHI.
5. Tokheim : Digital Electronics, TMH.
6. S. Rangnekar; Digital Electronics, ISTE/ EXCE.L
7. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill.
8. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India.
9. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design -The Hardware/Software Interface", Morgan Kaufmann,P. Hayes, "Computer Architecture and Organization", McGraw-Hill.

Note: Latest and additional good books may be suggested and added from time to time

SECOND SEMESTER

DATA STRUCTURES USING C
PAPER CODE: M.Sc.-201

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Programming fundamentals: Algorithm development, Techniques of problem solving, flow-chart, decision table, structured programming concepts; top-down design, development of efficient program; program correctness; debugging and testing of programs, algorithm for searching, sorting (exchange and insertion), Analysis of Algorithm: Frequency count, Time Space tradeoff.

UNIT-II

Programming in C: Introduction to C, Data type, constants and variable; Structure of a C program, Operators and Expressions, Control statements: Sequencing, Alteration and Iteration; Arrays: Representation of single and multidimensional arrays; sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices; String and pointers, Functions, Recursion.

UNIT-III

Stacks and Queues: Introduction and Primitive operations on stack; Stack application: Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion from infix to Postfix; Introduction and Primitive Operation on queues, D-queues and Priority queues, Circular queue.

Linked Lists: Introduction to Linked lists; Implementation of linked lists, operations such as traversal, Insertion, deletion, searching, Two way lists.

UNIT-IV

Trees: Introduction and Terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; threaded Binary trees, binary search trees; AVL trees, B tress.

File structure: Physical Storage devices and their characteristics, constituents of a file viz. fields, records, fixed and variable length records, primary and secondary keys; file operations, basic file system operations, file organizations: serial sequential, index sequential, direct, inverted, multilist.

Sorting Techniques: Bubble Sort, Insertion sort, Selection sort, merge sort, Heap sort, Quick sort.

Searching Techniques: Linear search, Binary search, Hashing function and Collision Handling methods.

Suggested Reading:

1. Kenneth, A. : C problem solving and programming, Prentice Hall.
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

3. Gottfried, B. : Theory and problems of Programming in C, Schaum Series.
4. Kerninghan & Ritchie : The Programming Language, PHI.
5. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource Pvt. Ltd.
6. R. S. Salaria, "Data Structure & Algorithms", Khanna Book Publishing Co. (P) Ltd.
7. P. S. Deshpande and O.G. Kakde, "C & Data Structure", Wiley Dreamtech..
8. Schaum's outline series, "Data Structure", TMH.

Note : Latest and additional good books may be suggested and added from time to time.

OBJECT ORIENTED PROGRAMMING USING C++
PAPER CODE: M.Sc.-202

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Object Oriented Programming Concepts: Procedural Language and Object Oriented approach. Characteristics of OOP: Objects, classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Passing.

Structure of C++ program: Data-types, Variables, Static Variables, Operators in C++, Arrays, Strings, Structure, Functions, Recursion, Control Statements.

UNIT-II

Classes: Class, object, Memory Allocation for Objects, memory layout of objects, private, public, protected member functions, static members. Constructors: Features, types, dynamic constructor, Parameterized constructors; destructors.

Memory management: Dynamic Memory allocation: new, delete, Object Creation at Run Time; This Pointer.

UNIT-III

Inheritance: Derived Class and Base Class, Different types of Inheritance, Overriding member function, Public and Private Inheritance, Ambiguity in Multiple inheritance, Virtual Inheritance, Abstract Class.

Polymorphism: Definition, operator overloading, Overloading Unary and Binary Operators, Function overloading, Virtual function, Friend function, Static function.

UNIT-IV

Exception handling: Throwing, Catching, Re-throwing an exception, specifying exceptions; processing unexpected exceptions; Exceptions when handling exceptions, resource capture and release.

Templates: Introduction; Class templates; Function templates; Overloading of template function, namespaces. Introduction to STL: Standard Template Library: benefits of STL; containers, adapters, iterators, vector, lists.

Suggested Books :

1. Herbert Schildts : C++ - The Complete Reference, Tata McGraw Hill Publications.
2. Balaguru Swamy : C++, Tata McGraw Hill Publications.
3. Balaguruswamy : Object Oriented Programming and C++, TMH.
4. Shah & Thakker : Programming in C++, ISTE/EXCEL.
5. Johnston : C++ Programming Today, PHI.
6. Olshevsky : Revolutionary Guide to Object Oriented Programming Using C++, SPD/WROX.
7. Object Oriented Programming and C++, Rajaram, New Age International.
8. Samanta : Object Oriented Programming with C++ & JAVA, PHI.
9. Subburaj : Object-Oriented Programming with C++, VIKAS.
10. Any other book(s) covering the constents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.

SOFTWARE ENGINEERING
PAPER CODE: M.Sc.-203

External: 80 **Time: 3Hrs**

Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction to Software Engineering: Software crisis, Software engineering Approach and Challenges, Software development process models with comparison: Waterfall, Prototype, Time boxing and Spiral Models, RAD Model and Automation through software environments. , Quality Standards like ISO 9001, SEI-CMM.

Requirement Analysis: Structured Analysis, Behavioral & non-behavioral requirements, Software requirement specification: components & characteristics, Function point metric.

UNIT II

Software Project Planning: Cost estimation, static, Single & multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management, project scheduling, personnel planning, team structure, Software configuration management, quality assurance, project monitoring, Empirical.

Software Design: Fundamentals, problem partitioning & abstraction, design methodology, Function Oriented Design, Cohesion, Coupling & their classification, User Interface Design, Detailed design, Information flow metric.

UNIT III

Software Design: Fundamentals, problem partitioning & abstraction, design methodology, Function Oriented Design, Cohesion, Coupling & their classification, User Interface Design, Detailed design, Information flow metric.

Coding: Choosing Programming Language, Characteristics of Program, Avoiding Dead Codes, and Program Metrics: Size Estimation; Complexity metric (McCabe's Cyclometic Complexity), Halsted Theory, Function Point Analysis.

Software Testing: Impracticality of Testing all Data and Paths, Levels of testing, Functional vs. Structural testing, Static and Dynamic Testing Tools, Regression testing, Mutation Testing, Stress Testing; Validation Vs. verification.

UNIT IV

Software Re-Engineering: Source Code Translation, Program Restructuring, Data Re-Engineering, Reverse Engineering.

Configuration Management: Maintaining Product Integrity, Change Management, Version Control, Configuration accounting: Reviews, Walkthrough, Inspection, and Configuration Audits; Reliability Models (JM, GO, MUSA Markov), Limitations of Reliability Models.

Suggested Reading:

1. Sommerville Ian, Software Engineering, Addison Wesley
2. Hoffer, George, Valacich, Modern System Analysis and Design . Pearson Education
3. Pressman S. Roger, Software Engineering, Tata McGraw-Hill.
4. Jalote Pankaj, An integrated Approach to Software, Engineering, Narosa Publishing House.
5. Jorgensen P. C., "Software Testing-A Craftman's Approach", CRC Press.
6. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.

Note: Latest and additional good books may be suggested and added from time to time.

COMPUTER NETWORKS
PAPER CODE: M.Sc.-204

External: 80 **Time: 3Hrs**

Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT-I

Introduction to Computer Network: Types of Networks, Network Topologies, OSI and TCP/IP Reference Models; Comparison of Models.

Data Communications Concepts: Digital Vs. Analog communication; Parallel and Serial Communication; Synchronous, Asynchronous and Isochronous Communication; Communication modes: simplex, half duplex, full duplex; Multiplexing; Transmission media: Wired-Twisted pair, Coaxial cable, Optical Fiber, Wireless transmission: Terrestrial, Microwave, Satellite, Infra red.

UNIT-II

Communication Switching Techniques: Circuit Switching, Message Switching, Packet Switching.

Data Link Layer Fundamentals: Framing, Basics of Error Detection, Forward Error Correction, Cyclic Redundancy Check codes for Error Detection , Flow Control.

Media Access Protocols: ALOHA, Carrier Sense Multiple Access (CSMA), CSMA with Collision Detection (CSMA/CD), Token Ring, Token Bus.

UNIT-III

High-Speed LAN: Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10G; Wireless LANs: IEEE 802.11, Bluetooth.
Network Layer: IP Addressing and Routing, Network Layer Protocols: IPv4 (Header Format and Services), ARP, ICMP (Error Reporting and Query message); IPv6 (Header Format and Addressing).

UNIT-IV

Transport Layer: Process-to-Process Delivery: UDP, TCP; Connection Management by TCP; Basics of Congestion Control.
Application Layer: Domain Name System (DNS); SMTP; HTTP; WWW.
Network Security: Security Requirements and attacks; Cryptography: Symmetric Key (DES, AES), Public Key Cryptography (RSA); Firewall.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", McGraw Hill.
2. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
3. Douglas E. Comer, "Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures", Pearson Education.
4. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems-Concepts and Design", Pearson Education.

Reference Books:

1. B. Muthukumaran, "Introduction to High Performance Networks", Vijay Nicole Imprints.
2. Wayne Tomasi, "Introduction to Data Communications and Networking", Pearson Education.
3. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education.
4. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
5. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
6. Andrew S. Tanenbaum, Marten Van Steen, "Distributed Systems-Principles & Paradigms", Pearson Education.

Note: Latest and additional good books may be suggested and added from time to time.

THIRD SEMESTER

COMPILER DESIGN
Paper Code: M.Sc.-301(i)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT – I

Overview of language processing: Preprocessors, compiler, assembler, interpreters, linkers & loaders , structure of a compiler, phases of a compiler.

Lexical Analysis: Role of Lexical Analysis, Lexical Analysis Vs. Parsing, Token, patterns and Lexemes, Lexical Errors, Regular Expression, Definitions for the language constructs, Strings, Sequences, Comments, Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.

UNIT – II

Syntax Analysis: Role of a parser, classification of parsing techniques, Top down parsing, First and Follow, LL(1) Grammars, Non-Recursive predictive parsing, Error recovery in predictive parsing.

Introduction to simple LR: Why LR Parsers, Model of an LR Parsers, Operator Precedence- Shift Reduce Parsing, Difference between LR and LL Parsers, Construction of SLR Tables.

UNIT – III

Powerful LR Parsers: Construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recovery in LR Parsing.

Semantic analysis: SDT, evaluation of semantic rules, symbol tables, use of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms.

UNIT – IV

Intermediate code: Three address code, quadraples, triples, abstract syntax trees, basic blocks, CFG. Machine independent code optimization; Common sub expression elimination, constant folding, copy propagation, dead code elimination, strength reduction, loop optimization, procedure inlining.

Machine dependent code optimization: Peephole optimization, register allocation, instruction scheduling, inter procedural optimization, garbage collection via reference counting.

Text books:

1. Compilers, Principles Techniques and Tools- Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman.
2. Principles of Compiler design, V. Raghavan, TMH.
3. Principles of Compiler design, Nandini Prasad, Elsevier

Reference books:

1. Compiler construction, Principles and Practice, Kenneth C Louden, CENGAGE

2. Implementations of Compiler, A new approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER.

Note : Latest and additional good books may be suggested and added from time to time.

COMPUTER SECURITY
PAPER CODE: M.Sc.-301(ii)

External: 80 **Time: 3Hrs**

Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Unit-I

The Security Problem in Computing: The meaning of Computer Security, Computer Criminals, Methods of Defense, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms, The Data Encryption Standard, The AES Encryption Algorithm, Public Key Encryptions, Uses of Encryption.

Unit-II

Program Security: Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security polices, models of security, trusted O.S. design, Assurance in trusted OS.

Unit-III

Database Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security.

Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

Unit-IV

Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security. Legal Privacy and Ethical Issues in Computer Security:

Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security, Case studies of Ethics.

Suggested Readings:

1. P. Pfleeger, Shari Lawrence Pfleeger Charles: Security in Computing, PHI.
2. William Stallings: Cryptography & Network Security, Pearson Education.
3. Charlie Kaufman, Radia Perlman, Mike Speciner: Network Security, Private communication in a public world, PHI.
4. Douglas R.Stinson: Cryptography – Theory and Practice, CRC Press.
5. Bruce Schneier , Niels Ferguson: Practical Cryptography, Wiley Dreamtech India Pvt Ltd.
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

COMPUTER GRAPHICS
PAPER CODE- M.Sc.-301(iii)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Overview of Computer Graphics: Computer Graphics and Its Types, Applications of Computer Graphics; Graphics Display Devices: CRT (Random-Scan and Raster Scan Monitor), Color CRT Monitors, Refresh CRT and Interlacing; DVST, Emissive and Non- Emissive Display devices; Hard copy devices; Graphics Software Standards.

UNIT-II

Scan Conversion: Scan Converting a Point, Line: Slope Method, DDA and Bresenham's Algorithm, Circle: Mid Ponit and Bresenham's Algorithm, Anti- aliasing.

2-D Graphics Transformations: Rotations, Scaling, Translation, Reflection, Shearing; Homogeneous coordinates: Need, Transformations in Homogeneous Coordinates. Composite Transformation.

UNIT-III

Polygon Filling: Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation.

Two-Dimensional Viewing: The Viewing Pipeline, Window to View port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping for convex and concave polygons, Text Clipping, Exterior Clipping.

UNIT-IV

Interactive Picture-Construction Techniques: Basic Positioning Method, Constraints, Grids, Gravity field, Rubber Band Methods, Dragging, Painting and Drawing.

Three–Dimensional Concepts: Three Dimensional Display Methods: Parallel Projection and Perspective Projection; 3D Transformations: Translation, Rotation & Scaling. Applications of 3D graphics.

Suggested Readings:

1. Hearn, D.,Baker, : Computer Graphics, Prentice Hall.
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Bufford: Multimedia Systems, Addison Wesley.
6. Jeffcoate : Multimedia in Practice, Prentice-Hall.

Note : Latest and additional good books may be suggested and added from time to time.

MANAGEMENT INFORMATION SYSTEM
PAPER CODE- M.Sc.-302(i)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Evolution of MIS: Concepts, framework for understanding and designing MIS in an Organization.
Organization and Information Systems: The Organization: Structure, Managers and activities, Data, information and its attributes , The level of people and their information needs , Types of Decisions and information , Information System, categorization of information on the basis of nature and characteristics.

UNIT-II

Kinds Of Information Systems: Transaction Processing System (TPS), Office Automation System (OAS), Management Information System (MIS), Decision Support System (DSS) and Group Decision Support System (GDSS), Expert System (ES), Executive Support System (EIS or ESS).

UNIT-III

Manufacturing and Service Systems: Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank.
Enterprise System: Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases.

UNIT-IV

Choice of IT: Nature of IT decision; Strategic decision; Configuration design and evaluation Information technology implementation plan.
Security and Ethical Challenges: Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

Suggested Books :

1. Management Information Systems, Kenneth J Laudon, Jane P. Laudon, Pearson/PHI.
2. Management Information Systems, W. S. Jawadekar, Tata McGraw Hill.
3. Introduction to Information System, James A. O' Brien, Tata McGraw Hill.
4. Management Information Systems, S.Sadagopan, PHI.
5. Management Information Systems, Effy Oz, Thomson Course Technology.
6. Corporate Information Strategy and Management", Lynda M AppleGate, Robert D Austin et al, Tata McGraw Hill.

Note : Latest and additional good books may be suggested and added from time to time.

DIGITAL IMAGE PROCESSING
PAPER CODE: M.Sc.-302(ii)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 (short parts -answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Digital Image Processing: Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels.

Image Enhancement: Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

UNIT – II

Filtering in frequency domain: Fourier Series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering.

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothening and sharpening of images.

UNIT – III

Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration.

Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

UNIT – IV

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

Image Representation: Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

Text Book:

1. Gonzalez R.C., Woods R.E., "Digital Image Processing", Pearson Education.
2. Vipula Singh, "Digital Image Processing with MATLAB and LABVIEW", Elsevier India.

Reference Books:

1. Ganzalez R.C., "Digital Image Processing with MATLAB", Tata McGraw Hill.
2. Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning.
3. William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.
4. Chanda B., Majumder D. Dutta, "Digital Image Processing and Analysis", PHI Learning.
5. Jain A.K., "Fundamental of Digital Image Processing", PHI Learning.
6. Jayaraman S., Esakkirajan S., Veerakumar T., "Digital Image Processing", Tata McGraw Hill.
7. Annadurai, "Digital Image Processing", Pearson Education

Note : Latest and additional good books may be suggested and added from time to time.

ARTIFICIAL INTELLIGENCE
PAPER CODE- M.Sc.-302(iii)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Problem solving: State space search: Production systems, Search space control, Depth first search, unknown search, Hill climbing best first search, branch and bound. Best First Search, Problem Reduction, Constraints, Satisfaction, Means End Analysis.

UNIT-II

Knowledge Representation: Predicate logic: Skolemzing queries, Unification, Modus pones, Resolution, dependency directed back tracking.
Rule Based Systems: Forward reasoning Conflict resolution, Backward reasoning. Use of non back track.

UNIT-III

Perception: Sensing, Speech recognition, Vision, Action, Neural networks: Introduction, Comparison of artificial neural networks with biological neural networks, Learning in neural networks, Perceptions, Back propagation networks, application of neural networks.
Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller

UNIT-IV

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques.
Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts.

Suggested Readings :

1. Rich Elaine and Knight Kevin : Artificial Intelligence, Tata McGraw Hill .
2. Tani Moto : Introduction to AI using LISP.
3. Patterson : Artificial Intelligence and Expert Systems.
4. Winston, P.H. and: LISP B.K.P.
5. Sangal Rajeev : LISP Programming, Tata McGraw Hill.
6. Balagurusamy : Artificial Intelligence & Technology.
7. Mishkoff, Henry C: Understanding Artificial Intelligence, BPB Publ.
8. Bharti & Chaitenya: Natural Language Processing, PHI

Note : Latest and additional good books may be suggested and added from time to time.

OPERATING SYSTEM AND UNIX
PAPER CODE- M.Sc.-303

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Operating systems overview: Operating systems as an extended machine & resource manager, Operating systems classification; Operating systems and system calls; Operating systems architecture.
Process Management functions: Process model, hierarchies, and implementation; process states and transitions; multi-programming, multi-tasking, multi-threading; level of schedulers and scheduling algorithms.

UNIT-II

Memory Management and Virtual Memory : Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing.

UNIT-III

Device Management functions: I/O devices and controllers, interrupt handlers, Types of I/O Software: Device independent I/O software, User-space I/O software, Terminal I/O software. Disk scheduling.
File management functions: file naming, structure, types, access mechanisms, attributes and operations; directory structures and directory operations; file space allocations; file sharing, file locking; symbolic links; file protection and security: distributed file systems.

UNIT-IV

Concurrent programming: sequential and concurrent process; precedence graph, Bernsterins condition; time dependency and critical code section, mutual exclusion problem; classical process co-ordination problems; deadlock handling, inter-process communication.
Unix Operating System: Overview of UNIX OS in general and implementation of all above functions in Unix Operating System.

Suggested Readings

1. Tenenbaum : Modern Operating Systems, Prentice-Hall.
2. Godbole : Operating System, Tata McGraw-Hill.
3. Peterson, James L: Operating System Concepts, Addison Wesley Publ. & Silberschatz Comp.
4. Deitel, H.M. : An Introduction to Operating System, Addison Wesley Publ. Comp.
5. Brain Kernighen & Rob Pike: The UNIX Programming Environment, Prentice Hall.
6. Maurice Bach :Design of the UNIX Operating System, Prentice Hall.
7. Stephen Prato :Advanced UNIX-Programmer's guide, BPB.
8. Sumitabha Das : UNIX Concepts and Applications – Featuring SCO UNIX and LINUX, TMH.

Note : Latest and additional good books may be suggested and added from time to time.

VISUAL PROGRAMMING
PAPER CODE: M.Sc.-304

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction to Visual Basic: VB IDE, An overview of VB project types, VB as event-driven & object-based language, Default Controls in Tool Box: Label Box, Text Box, Command Button, List Box, Combo Box, Picture & Image Box, Shape box, Timer, Option button, Check Box & Frames.

Programming with VB: Variables, Constants, Data types, Variable Scope, Arithmetic operations, String Operations, Built-in functions, I/O in VB, Branching & Looping statements, Procedures, Arrays, Collection.

UNIT-II

Working with Forms: Working with multiple forms; Loading, Showing and Hiding forms; Creating Forms at Run Time. Introduction to MDI forms. Dialog Boxes: Types of Dialog boxes, Working with Common Dialog Box.

Menu Manipulation: Introduction to Menu Editor, Adding Menus and its manipulation: Modifying and Deleting Menu Items, Creating Submenus.

UNIT-III

Advanced Controls in VB: Introduction: Scroll Bar, Slider Control, Tree View, List View, Rich Text Box Control, Toolbar, Status Bar, Progress Bar, Cool bar, Image List, Tab Strip.

Working with Graphics: Using Paint, Line, Circle, RGB and other related method, manipulating graphics.

UNIT-IV

File Handling in VB: Creating a File, Saving and Opening files in Rich text box and Picture box, Handling file operations.

VB & Databases: The Data Controls and Data-Bound Controls; Using DAO, RDO, ADO.

ActiveX controls: Creating & Using ActiveX Controls, Creating & Using ActiveX Documents, ActiveX EXE vs. ActiveX DLL.

Text Books:

1. Visual Basic 6 Programming: Black Book By Steven Holzner, dreamtech PRESS
2. Mastering Visual Baisc 6 By Evangelos Petroutsos BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata McGraw-Hill Edition.

Reference Books:

1. Step by Step Microsoft Visual Basic 6.0 Professional By Michael Halvorson PHI
2. Visual basic 6 Complete BPB
3. Teach Yourself Visual basic 6 By Scott Warner Tata McGraw-Hill Edition
4. Using Visual Basic 6 Special Edition By Brian Siler and Jeff Spotts PHI
5. Internet & World Wide Web How to Program, Pearson education, by: H.M. Deitel, P.J. Deitel, A.B. Goldberg.

Note : Latest and additional good books may be suggested and added from time to time.

FOURTH SEMESTER

JAVA PROGRAMMING
PAPER CODE- M.Sc.-401

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: Java History, Java features Java and Internet, Java and World Wide Web, Java Program Structure, Java Tokens, Java Virtual Machine, Data Types, Operators and Expressions, Decision Making and Branching, looping Classes and Methods**.** Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, types of Inheritance, Abstract Classes, Using Final Modifier.

UNIT-II

Polymorphism: Types of polymorphism. Packages & Interfaces: Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Access Protection in Packages, Concept of Interface.
Exception Handling: Types of Exceptions, Dealing with Exceptions, Exception Objects.

UNIT-III

Multithreading Programming: Understanding Threads, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks Inter-thread communication
Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console. Creating Applets in Java: Applet Basics, Applet Architecture, Applet Life Cycle, Simple Applet Display Methods, Requesting Repainting, Using The Status Window, The HTML APPLET Tag Passing Parameters to Applets.

UNIT-IV

AWT: Working with AWT Controls, AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, Displaying Information Within a Window.
Working with Graph: Working with Graphics, Working with Color, Setting the Paint Mode, Working with Fonts, Exploring Text and Graphics, Layout Managers and Menus.

Suggested Readings

1. Patrick Naughton & Herbert Schildt.: Java 2.0 : The Complete Reference, TMH.
2. Holzner Steven : Java 2, Swing, Servlets, JDBC & Java Beans Programming (Black Book), IDG Books India (P) Ltd.
3. Hatman & Eden : ASP with VBScript, SQL and HTML Programming Reference, IDG Books India(P), Ltd.
4. Jackson, J. : Java by Example, Sunsoft Press.
5. Wiber, J. : Using Java 2 Platform, PHI.
6. Harold, E. : Java Secrets, Comdex.
7. Zolli, A. : Mastering Java, BPB.

8. TiHel, E. :Discover Java, Comdex.

Note : Latest and additional good books may be suggested and added from time to time.

DATA WAREHOUSE AND MINING
PAPER CODE: M.Sc.-402(i)

Max. Marks: 80 **Time: 3Hrs.**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Unit-I

Data Warehouse: Need for data warehouse, Definition, Goals of data Warehouse, Challenges faced during Warehouse Construction, Advantages, Types of Warehouse: Data Mart, Virtual Warehouse and Enterprise Warehouse. Components of Warehouse: Fact data, Dimension data, Fact table and Dimension table, Designing fact tables. Pre-requisite Phases: Extract, Transform and load process. Warehouse Schema for multidimensional data: star, snowflake and galaxy schemas

Unit-II

Data warehouse and OLAP technology, Difference between OLTP and OLAP, Strengths of OLAP, Applications of OLAP. Multidimensional data models: Data Cubes & Data Cuboids, Lattice. OLAP operations: Advantages, Types: Roll up, Drill down, Pivot, Slice & Dice operations, Applications. OLAP Server: Need, Types: ROLAP, MOLAP and HOLAP, Features. Data warehouse Implementation, Introduction to Efficient computation of data cubes.

Unit-III

Data preprocessing: Need, Integral steps of preprocessing: Data integration, Data transformation, Data reduction, Discretization and Concept Hierarchy Generation. Data mining primitives, Types of Data Mining Systems, Data generalization & Summarization based characterization, Analytical characterization. Mining Association Rules in large databases: Association rule mining, Single dimensional Boolean association rules from Transactional Database Systems, Multi level association rules and Multidimensional association rules from relational DBS and DWS.

Unit-IV

Classification and Prediction: Basic Classification & Prediction Model, Difference between Classification & Prediction. Classification Algorithms: Decision tree induction & Back propagation. Prediction Algorithms: Regression approach: Linear & Non Linear regression. Cluster analysis: Purpose, Types: Partitioning and Hierarchical methods, Density based methods, Applications of Data Mining: Web mining, Temporal and Spatial data mining.

Suggested Readings:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.

5. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
7. A.K. Pujari: Data Mining Techniques, University Press.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
9. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.
10. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
11. Anahory S., Murray D. :Data Warehousing in the Real World, Addison Wesley.

ANALYSIS AND DESIGN OF ALGORITHMS
PAPER CODE: M.Sc.-402(ii)

Max. Marks: 80 **Time: 3Hrs.**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

Divide and Conquer: General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT-II

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Minimum spanning trees- Prim's and Kruskal's algorithms, Single source paths- Dijkastra algorithms and analysis of these problems.

Dynamic Programming: General method, Optimal binary search trees, 0/1 Knapsack, Traveling Salesperson Problem.

UNIT-III

Back Tracking: General method, 8 Queen's Problem, Graph coloring, Hamiltonian cycles and analysis of these problems.

Branch and Bound: Method, 0/1 Knapsack and Traveling Salesperson Problem, efficiency considerations.

UNIT-IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

Advanced data structures: Red-Black trees, B-trees, Fibonacci Heaps.

TEXT BOOKS:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, Galgotia Publ.
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: TMH.

REFERENCE BOOKS:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., Johan Wiley & Sons.
3. Writing Efficient Programs, Bentley, J.L., PHI.
4. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, MGH.
5. Introduction to Computers Science- An algorithms approach , Jean Paul Trembley, Richard B.Bunt, T.M.H.
6. Fundamentals of Algorithms: The Art of Computer Programming Voll, Knuth, D.E., Naresh Publ.

MULTIMEDIA AND ITS APPLICATIONS
PAPER CODE: M.Sc.-402(iii)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT-I

Introduction : Definition of multimedia, Multimedia Basics, Where to use Multimedia, Multimedia Elements, Multimedia Application, Virtual Reality, Delivering Multimedia, Multimedia Workstation Architecture, High resolution Graphic displays; Network architecture for Multimedia systems.

Evolving Technologies For Multimedia Systems: Hypermedia Documents; Hypertext - Hyper Speech - HDTV and UDTV, 3D Technology.

Multimedia Software: Overview of Multimedia Software Tools - Open Source Replacements - Multimedia Authoring - Some Useful Editing and Authoring Tools - VRML.

UNIT II

Text, Image and Sound Fundamentals: About Fonts and Face, Hypermedia and Hypertext. Images: Making Still Images, Bitmaps - 1 bit images - 8-bit gray level images - 8-bit color images- Dithering- 24 bit color images - Vector Drawing - Vector-Drawn Objects vs. Bitmaps. Sound: MIDI Audio - MIDI vs. Digital Audi; Multimedia System Sounds; Adding Sound to Your Multimedia Project, Audio Recording.

Animation: The Power of Motion- Principles of Animation - Animation by Computer - Animation Techniques, Types of Animation.

UNIT III

Data Compression: Need for Data compression - General Data compression Scheme - Compression standards - Non-lossy compression for images - Lossy compression for Photographs and video, Hardware Vs Software Compression, **:** Basics of Binary image compression

Data and File Format Standards: Popular File Formats - RTF, RIFF, GIF, PNG, TIFF, MIDI, JPEG, JFIF, AVI,WAV, BMP,WMF, MIX, MPEG standards - TWAIN.

UNIT IV

Multimedia input/output Technologies: Limitations of Traditional input devices - Multimedia input output devices - PEN input - Working of Electronic Pen - Video and image display systems - Video

display technology standards; CRT - display terminology, Flat panel display system. **Making Multimedia:** The Stages of a Multimedia Project, Creativity, Organization, Communication - Hardware - Software - Text Editing and Word Processing Tools - OCR Software - Painting and Drawing Tools, 3-D Modeling and Animation, Authoring Systems - Making Instant Multimedia - Types of Authoring Tools.

Reference Books:

1. Bufford: Multimedia Systems, Addison Wesley.
2. Vaughan, Tay, 1993, Multimedia: Making It Work, Osborne/McGraw-Hill, Berkeley.
3. Jeffcoate : Multimedia in Practice, Prentice-Hall
4. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew
5. Multimedia Systems Design - Prabhat k.Andleigh, Kiran Thakra.
6. Computer Graphics Multimedia and Animation - Malay K. Pakhira PHI , New Delhi.
7. Principles of Multimedia - Ranjan Parekh - TMGH, New Delhi - Twelfth Reprint,
8. Computer Graphics and Multimedia - Anirban Mukhapathyay, Aruop Chattopadhyay - Vikas Publishing Ltd - Second Edition
9. Multimedia Technology & Applications- David Hillman Galgotia Publications Pvt Ltd.- Second Edition

INTERNET AND WEB DESIGNING
PAPER CODE- M.Sc.-403(i)

External: 80 **Time: 3Hrs**
Internal: 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction: Internet, Evolution of Internet, Types of Computer Network: LAN, WAN, MAN Internet Protocol, Internet Services, WWW, Working of Internet, Introduction to Intranet, DNS working, Configuring Internet Connection, Internet Connection Concepts, Connecting LAN to Internet; Client-Server environment: Single User, Multi User, Server, Workstation, Computer Network; Network Topologies; Network Protocols, E-Mail Concepts – Configuring E-Mail Program, Sending and Receiving Files through E-Mail, Fighting Spam, Sorting Mail, E-Mail mailing lists and avoiding E-Mail viruses.

UNIT-II

Searching and Web Casting Technique: Popular web servers, Web Browsers; basic features of browsers: bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines; Hypertext Transfer Protocol (HTTP), URL.

Internet Tools: Online Chatting, Messaging, and Conferencing Concepts, Usenet newsgroup concepts: Reading usenet newsgroups, Instant messaging, Web-Based chat rooms and discussion boards, Voice and Video conferencing. Streamlining Browsing, Keeping track of Favorite Web Sites, Web Security, Privacy, and Site-Blocking.

UNIT-III

Web Designing using HTML: Understanding HTML, XHTML Syntax and Semantics, HTML Elements: Paragraph, Lists, Tables, Images, Frames, Forms, Linking to other Web Pages: External

and Internal linking, E-mail Links; Working with Background colors and Images; Marquee; Text Alignment and Text Formatting, Advanced Layout with Tables; Publishing HTML Pages.

UNIT-IV

Cascading Style Sheets: Introduction, Inline, Internal, External CSS, Linking CSS to Web Page.
Client–Side Programming: Introduction to JavaScript, Basic Syntax, Variables and Data types, Statements, Operators, Literals, Functions, Objects, Arrays.
XML: Relation between XML and HTML, Goals of XML, Structure and Syntax of XML, Well Formed XML, DTD and its Structure, tree structures in data organization, Searching with XPath.

Reference Books :

1. Fundamentals of the Internet and the World Wide Web, Raymond Greenlaw and Ellen Hepp.TMH.
2. Internet & World Wide Programming, Deitel, Deitel & Nieto. Pearson Education.
3. Complete reference guide to java script, Aron Weiss, QUIE.
4. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
5. Satish Jain: "O" – Level Information Technology,
6. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
7. V.K. Jain: "O" – Level Information Technology, BPB Publications

SOFTWARE TESTING
PAPER CODE: M.Sc.-403(ii)

Max. Marks: 80 **Time: 3 Hrs.**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behaviour and correctness, Testing and debugging, Test metrics and measurements, STLC, Verification, Validation,
Types of testing: Functional and non – functional Testing; system testing, recovery testing, security testing, stress testing, performance testing, usability testing; Software Quality and Reliability, Software defect tracking.

UNIT-II

Testing Techniques: White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

UNIT-III

Integration, System, and Acceptance Testing: Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Design/Architecture verification, Deployment testing, Scalability testing, Reliability testing, Alpha, Beta and Acceptance Testing: Acceptance criteria; test cases selection and execution.

Testing Object Oriented Software: Unit Testing in OO Context, Integration Testing in OO Context, OO testing methods, Class level testing, Interclass test case design, testing for real time system.

UNIT-IV

Test Selection & Minimization for Regression Testing: Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Test Management and Automation Test Planning: Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection.

Text Books:

1. Jorgensen P. C., "Software Testing-A Craftman's Approach", CRC Press.
2. Software Testing techniques - Baris Beizer, Dreamtech.
3. 2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
4. Jeff Tian, Software Quality Engineering (SQE), Wiley
5. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley
6. John W. Horch, Practical Guide to Software Quality Management, Artech house publisher.
7. Robert Dunn, Software Quality Concepts and Plans, Prentice-Hall.
8. Alan Gillies, Software Quality, Theory and Management, Chapman and Hall.

Reference Books:

1. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.
2. Michael Dyer, The Cleanroom approach to Quality Software Engineering, Wiley & Sons.
3. Daniel Freedman, Gerald Weinberg, Handbook of Walkthroughs, Inspections and Technical Reviews,Dorset House Publishing.
4. Tom Gilb, Dorothy Graham, Software Inspection, Addison-Wesley.
5. Arthur Lowell, Improving Software Quality an Insiders guide to TQM, John Wiley & Sons.

ADVANCES IN DATABSE SYSTEMS
PAPER CODE: M.Sc.-403(iii)

Max. Marks: 80 **Time: 3 Hrs.**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Unit-I

The Extended Entity Relationship Model: The ER model revisited, EER model.

Object-Oriented Databases: Overview of Object-Oriented concepts, Encapsulation of operations, Methods and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control.

Unit-II

Object Relational Database: Database design for an ORDBMS – Nested relations and collections; Storage and access methods, Query processing and Optimization, Comparison of OODBMS and ORDBMS.

Decision Support Systems: Information Retrieval Systems, Decision Support system, Data Analysis and OLAP, Data Mining.

Unit-III

Parallel Database: Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins;

Distributed database: Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases

Unit-IV

Client-Server Architecture: Client Server Architectures: Two-tier and Three-tier Client Server Architecture, Server Architectures.

Enhanced Data models: Active database, Temporal database, Spatial databases: Concepts and architecture, Deductive databases and Query processing; Mobile databases, Geographic information systems, Multimedia databases.

Text Books:

1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education.
2. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill
2. Peter Rob and Coronel, Database Systems, Design, Implementation and Management, Thomson Learning.
3. C.J.Date, Longman, Introduction to Database Systems, Pearson Education
4. Thomas Connolly,Carolyn Begg, Database Systems, Pearson Education

PROJECT REPORT
PAPER CODE: M.Sc.-405

External: 80
Internal: 20

1. Each student should carry out Project using the software development tools /languages/ technologies that they have learnt and/or have studied during the concerned semester or any other development tools in view of the ongoing Software Industry trends.
2. It should be done by the student in an organization/college under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
3. The Project has to be assigned to the students in the beginning of the 4th Semester.

M.Sc. (Computer Science)

Program Outcome

- Provides technology-oriented students with the knowledge and ability to develop
- Creative solutions. Develop skills to learn new technology.
- Apply computer science theory and software development concepts to construct
- Computing-based solutions. Design and develop computer programs/computer-based systems in the areas
- Related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications.

Learning Objectives & Learning Outcomes
Semester-I

Subject: Computer Fundamentals And Programming in C
Subject Code: M. Sc.-102, 105 (HC)
Periods per week:6
Practical per week:6
Duration of Period:45 minutes

Course Objective:

The objectives of this course are:

- This course introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- The C programming language is used but the course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.

Course Outcome:

On completion of the course students will be able to:

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.

- Understand the dynamic behavior of memory by the use of pointers.
- Use different data structures and create / manipulate basic data files and developing applications for real world problems.

Subject-DBMS
Subject Code-Msc-103, 105 (HC)
Periods per week-6
Duration of Period-45 minutes

COURSE OBJECTIVES:-

At the end of this course, students should be able to do the following:

- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- Design and implement a small database project using Microsoft Access.
- Understand the concept of a database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols.

Learning Outcomes:-

Upon successful completion of this course, students should be able to:

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.

Subject: -Computer Organization and Architecture
Subject code:- M.Sc.-104 (SC)
Period per week: 6
Duration of period: 45 minutes

Course Objectives:
Students will try to learn:

- Conceptualize the basics of organizational and architectural issues of a digital computer.
- Analyze processor performance improvement using instruction level parallelism.
- Learn the function of each element of a memory hierarchy.
- Study various data transfer techniques in digital computer.
- Articulate design issues in the development of processor or other components that satisfy design requirements and objectives.

Learning Outcomes:
Students will able to:

- Describe basic organization of computer.
- Implement assembly language program for given task.
- Demonstrate control unit operations and conceptualize instruction level parallelism.
- Demonstrate and perform computer arithmetic operations on integer and real numbers.
- Categorize memory organization and explain the function of each element of a memory hierarchy.
- Identify and compare different methods for computer I/O mechanisms.

Learning Objectives & Learning Outcomes
Semester-II

Subject-Data structures using c
Subject Code-Msc-201, 205 (HC)
Periods per week-6
Duration of Period-45 minutes

Course objectives:

All the end of the course the students will be able to:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques.
- To Understand basic concepts about stacks, queues,lists,trees and graphs.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- Ability to analyze algorithms and algorithm correctness.

- Ability to summarize searching and sorting techniques.
- Ability to describe stack, queue and linked list operation.
- Ability to have knowledge of tree and graphs concepts.

Subject: Objected Oriented Programming Using C++
Subject Code: M. Sc-202, 205(HC)
Periods per week: 06
Practicals per week: 06
Duration of period: 45 minutes

Course Objectives

A study of the subject matter presented in this course will enable the student to become familiar with:

- To give an overview of benefits of Object Oriented Programming (OOP) approach over the Traditional Programming approach.
- To deliver comprehensive view of OOP concept.
- To impart detailed knowledge of a powerful object oriented programming language – C++.
- To impart detailed knowledge of a abstracting mechanism.
- To gain knowledge of inheritance and polymorphism.
- To gain knowledge programming with exception handling.

Course Outcomes

On successful completion of this module, students should be able to:

- Familiarization with a widely used programming concept – Object Oriented Programming.
- Develop logical thinking.
- Skill to write codes in C++ by applying concept of OOP, such as Objects, Classes, Constructors, Inheritance etc., to solve mathematical or real world problems .
- Ability to isolate and fix common errors in C++ programs.
- Skill to write code of abstracting mechanism.
- Skill to write programming code of inheritance and polymorphism.
- Ability to write code of exception handling.

Subject: Software Engineering
Subject code: M. Sc. 203 (HC)
Period per week: 6
Duration of period:45 minutes

Learning Objectives:

The educational objectives of the Software Engineering Program are to produce graduates who, within three years after graduation, are able to:

- Be employed in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and expanded leadership responsibility.
- Demonstrate the ability to work effectively as a team member and/or leader in an ever-changing professional environment and
- Progress through advanced degree or certificate programs in computing, science, engineering, business, and other professionally related fields.

Learning Outcomes:

Graduates of the program are expected to demonstrate:

- An ability to identify, formulates, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- An ability to communicate effectively with a range of audiences.
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- An ability to develop and conduct appropriate experimentation analyzes and interprets data, and use engineering judgment to draw conclusions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Learning Objectives & Learning Outcomes
Semester-III

Subject-Computer Graphics

Subject Code-M.Sc.- 301 (SC), 305 (HC)
Periods per week-6
Duration of Period-45 minutes

Course objectives:

All the end of the course the students will be able to:

- To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3- dimensional computer graphics.
- Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
- To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies and principles.

COURSE OUTCOMES:
After completing this course the student must demonstrate the knowledge and ability to:

- To list the basic concepts used in computer graphics.
- To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
- To describe the importance of viewing and projections.
- To define the fundamentals of animation, virtual reality and its related technologies.
- To understand a typical graphics pipeline 6. To design an application with the principles of virtual reality

Subject-MIS
Subject Code- M. Sc.-302 (SC)
Periods per week-6
Duration of Period-45 minutes

Course objectives:

All the end of the course the students will be able to:

- The MIS is define as an integrated system of man and machine for providing the information to support the operations, the management , and the decision-making .
- Introduction to MIS Database Management for Information system Introduction to Telecommunications Building E-Commerce and E-business E-Commerce Security.
- Describe the role of information technology and information systems in business › Record the current issues of information technology and relate those issues to the firm. › Interpret how to use information technology to solve business problems. › Illustrate the impact of information systems in society.
- Theoretical models used to construct database. Demonstrate the role of database in supporting web Applications.
- Articulate the fundamental principals of telecommunication. › List the principals of wired and wireless telecommunication. Establish and understanding of the various techniques for telecommunication implementation and design. › Construct a solution to a business problem.

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- Explain complex software within the context of business user needs through training presentations and written documentation.
- Distinguish relationships between programming languages and information systems.
- Analyze existing systems and design technology solutions appropriate to the goals of an organization.
- Determine factors influencing the strengths and weaknesses of the most common computer operating systems and determine how one would be preferred over others.
- Effectively utilize database and database management systems to organize, store and retrieve data.

Subject: - Operating System and Unix
Period per week: 12
Paper code: M. SC.-303, 305 (HC)
Duration of period: 45 minutes

Course Objectives:

Students will try to learn:

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.

- To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.
- To introduce Basic Unix general purpose Commands.
- To learn network Unix commands.
- To learn shell script.
- To learn file management and permission advance commands.
- 10 To learn awk, grap, perl scripts.

Learning Outcomes:
Students will able to:

- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- Understand the process management policies and scheduling of processes by CPU.
- Evaluate the requirement for process synchronization and coordination handled by operating system.
- Describe and analyze the memory management and its allocation policies.
- Identify use and evaluate the storage management policies with respect to different storage management technologies.
- Identify the need to create the special purpose operating system.
- Identify the basic Unix general purpose commands.
- Apply and change the ownership and file permissions using advance Unix commands.
- Use the awk, grep, perl scripts.
- Implement shell scripts.
- Apply basic of administrative task.
- Apply networking Unix commands.

Subject-Visual Programming
Subject Code-MSC-304, 305 (HC)
Periods per week-6
Duration of Period-45 minutes

Course objectives:
All the end of the course the students will be able to:

- Understand basic programming concepts.

- Have an understanding of the interaction between software and hardware.
- Know how to integrate media content into a programming environment.
- Understand key logic and design issues when creating media artwork.
- Be able to design and build basic media-rich programs using Max/MSP and Jitter.

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- Students list the visual programming concepts.
- Explain basic concepts and definitions.
- Express constants and arithmetic operations.
- Distinguish variable and data types.
- Students code visual programs by using Visual Basic work environment.
- Distinguish and compose events and methods.
- Recognize and arrange control structures.
- Design a complete program using visual programming concepts.
- Students prepare various projects by helping visual programming.
- Prepare project in visual programming.
- Manage and analyze prepared project with programs.
- Interpret and report obtaining results.

Learning Objectives & Learning Outcomes
Semester-IV

Subject-Java Programming
Subject Code- M.Sc.-401(HC), 404 (SC)
Period per week: 6
Practical per week: 6
Duration of Period-45 minutes

Course objectives:
At the end of the course the students will be able to:

- Learn why Java is useful for the design of desktop and web applications.
- Learn how to implement object-oriented designs with Java.
- Identify Java language components and how they work together in applications.
- Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.

- Understand importance of Multi-threading & different exception handling mechanisms.
- Learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.

COURSE OUTCOMES:
After completing this course the student must demonstrate the knowledge and ability to:

- Understand the use of OOPs concepts.
- Solve real world problems using OOP techniques.
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
- Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
- Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events.

Subject- Analysis and Design of Algorithms
Subject Code- M. Sc.-402 (SC)
Periods per week-6
Duration of Period-45 minutes

Course objectives:

All the end of the course the students will be able to:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.

- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
- Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
- Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.

Learning Objectives:

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Understand how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.
- Learn CSS grid layout and flexbox.
- Learn techniques of responsive web design, including media queries.
- Develop skills in digital imaging (Adobe Photoshop.)
- Develop basic programming skills using Javascript and jQuery.
- Be able to embed social media content into web pages.

Learning Outcomes:

Upon completion, graduates with a BS degree in Web Design & Development will be able to:

- Employ fundamental computer theory to basic programming techniques.
- Use fundamental skills to maintain web server services required to host a website.
- Select and apply markup languages for processing, identifying, and presenting of information in web pages.
- Use scripting languages and web services to transfer data and add interactive components to web pages.
- Create and manipulate web media objects using editing software.
- Incorporate aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements.
- Conceptualize and plan an internet-based business that applies appropriate business models and web technologies.
- Combine multiple web technologies to create advanced web components.
- Design websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations.

Project Report

Subject: Project Report
Subject Code: M. Sc-405 (HC)
Periods per week: 06
Practicals per week: 06
Duration of period: 45 minutes

Course Objectives

A study of the subject matter presented in this course with following instructions:

- Each student should carry out Project using the software development tools /languages/
- technologies that they have learnt and/or have studied during the concerned semester or any other development tools in view of the ongoing Software Industry trends.
- It should be done by the student in an organization/college under the supervision of the
- staff(s) assigned by Head of the Department/Principal.
- The Project has to be assigned to the students in the beginning of the 4th Semester

Course Outcomes

On completion of the course, students are able to:

- Deal with real world data.
- Familiar about real time IT industry environment.
- Experience about applying the knowledge they got until now.
- Build a whole real time working system which will satisfy all customers' needs.

M. Com.

Subject: Computer Application in Business
Subject Code: 16MC021C4
Periods per week: 06
Practicals per week: 03
Duration of period: 45 minutes

COURSE OBJECTIVES:

A study of the subject matter presented in this course will enable the student to become familiar with:

- Ms-Windows/Operating System.
- Computer Networks.
- Internet and E-Commerce.
- Make student aware of MS-Word.
- Acquire knowledge on MS-Excel.
- Get familiar with the concepts of MS-Power point.
- Accounting Package- Tally (ERP 9).
- Statistical Packages (SPSS).

LEARNING OUTCOMES:

On successful completion of this module, students should be able to:

- Practical knowledge and use of the Windows operating system.
- Knowledge computer Networks.
- Knowledge of Internet and E-Commerce.
- Creating word documents for office use.
- Formatting techniques and presentation styles.
- Knowledge of mail merge.
- Use of Basic functions and formulas.
- Using excel workbooks and templates.
- Use Accounting Package- Tally (ERP 9).

- Knowledge of SPSS.