Indira Gandhi University, Meerpur Rewari

Syllabus for M.Sc. (Computer Science)- Regular

Session –w.e.f. 2019-2020

Indira Gandhi University, Meerpur, Rewari
Syllabus and Scheme of Examinations
Master of Science (Computer Science) - Regular
w.e.f. from 2019-20
M.Sc.(Computer Science) First Year

First Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	(L:T:P)	Credits
MCS101	Discrete Mathematics	80	20	100	4:0:0	4
MCS102	Computer Fundamentals and Programming in C	80	20	100	4:0:0	4
MCS103	Data Base Management Systems	80	20	100	4:0:0	4
MCS104	Computer Organization and Architecture	80	20	100	4:0:0	4
MCS105	Seminar			25	0:0:0	1
MCS106	Self Study Paper			25	0:0:0	1
MCS107	Practical-I (Based on MCS102 & MCS103	100*	-----	100	0:0:4	4
						Total Credits=22

Total Credits   : 22

Second Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)	Credits
MCS201	Data Structures Using C	80	20	100	4:0:0	4
MCS202	Object Oriented Programming Using C++	80	20	100	4:0:0	4
MCS203	Software Engineering	80	20	100	4:0:0	4
MCS204	Computer Networks	80	20	100	4:0:0	4
MCS205	Seminar	-	-	25	0:0:0	1
MCS206	Self Study Paper	-	-	25	0:0:0	1
MCS207	Practical-II (Based on MCS201 & MCS202)	100*	-----	100	0:0:4	4
						Total Credits=22
Foundation Elective (FEC)						
To be Chosen from the pool of Foundation Electives provided by the university.					2 Credits	2
						Total Credits: 24

*
   20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

M.Sc.(Computer Science) Second Year

Third Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	(L:T:P)	Credits
MCS301	Computer Graphics	80	20	100	4:0:0	4
MCS302	Management Information System	80	20	100	4:0:0	4
MCS303	Operating System and Unix	80	20	100	4:0:0	4
MCS304	Visual Programming	80	20	100	4:0:0	4
MCS305	Seminar			25	0:0:1	1
MCS306	Self Study Paper			25	0:0:1	1
MCS307	Practical-III (Based on MCS303, MCS304,MCS301C)	100*	-----	100	0:0:4	4
					Total Credits=22	22
Open Elective (OEC)						
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

Fourth Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	(L:T:P)	Credits
MCS401	Java Programming	80	20	100	4:0:0	4
MCS402	Data Warehouse and Data Mining OR	80	20	100	4:0:0	4
MCS403	Internet and Web Designing	80	20	100	4:0:0	4
MCS404	Seminar			25	0:0:0	1
MCS405	Self Study paper			25	0:0:0	1
MCS406	Practical-IV (Based on MCS401, MCS403A)	100*	-----	100	0:0:4	4
MCS407	Project Report	100**	-----	100	0:4:0	4
						Total Credits=22

*
  20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

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  20 marks out of 100 will be based on the progress of the candidate in the Project assigned during the semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

SELF-STUDY PAPER

The objective of this course is to create habits of reading books and to develop writing skills in a manner of creativity and originality. The students will select a topic of their interest with consultation with their teachers/In charge/mentors. After selecting a suitable title for the paper, the student will be required to prepare a hand written report about 6-10 pages in his/her own handwriting. The student will be required to submit the report after getting it checked by the concerned teacher and will be asked to resubmit the report after making the required correction (s) if any before the commencement of the examination of that semester. The structure of the paper will include the following:

➢ Introduction

➢ Main Body

➢ Conclusion

The thoughts presented in the paper must be original work of the students.
The paper will be evaluated by the panel (one external and one internal examiner) to be appointed by the Chairperson of Department from the prescribed panel of the University.
The evaluation of Self Study paper will be done as given below:

➢ Evaluation of the paper 15 Marks
➢ Viva-voce on the paper 10 Marks
➢ Total 25 Marks

SEMINAR

Students are required to prepare a presentation on any topic, not from syllabus, assigned by the teacher concerned in the department on the theme/topic such as review of research papers/articles published in national or internal journal or any other research based paper in his/her area of interest. Every candidate will have to deliver a seminar of 15-20 minutes duration on the assigned topic. The seminar will be delivered in the presence of students and teachers of the department on any fixed week day of the semester.

The seminar will be evaluated by an internal committee of two internal teachers, constituted by the Chairperson of the Department. The evaluation (internal evaluation only) will be based on the presentation of the student, depth of subject matter of the topic and answer to questions. There will be a Coordinator to be nominated by the Chairperson of the Department among the teachers of the Department..

Distribution of marks will be as follows:

1. Presentation = 10 Marks

2. Relevancy & Depth of subject matter of the topic = 10 Marks

3. Answers to the Questions = 5 Marks

DISCRETE MATHEMATICS
PAPER CODE: MCS101

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

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

COMPUTER FUNDAMENTALS AND PROGRAMMING IN C
PAPER CODE: MCS102

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. Fundamental of Computers and Programming in C, by Satinder Bal Gupta & Amit Singla, Shree Mahavir Book (Publishers), New Delhi.
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

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

DATA BASE MANAGEMENT SYSTEMS
PAPER CODE: MCS103

External: 80
Internal: 20   **Times: 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 additio n 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. Introduction to Database Management System by Satinder Bal Gupta, Aditya Mittal, University Science Press, New Delhi
2. Raghurama Krishnan : Data base Management Systems, Johannes Gehrke, Tata McGraw Hill.
3. Siberschatz, Korth : Data base System Concepts, McGraw Hill.
4. C.J. Date : Introduction to Database Systems, Pearson Education.
5. Elmasri Navrate : Data base Management System, Pearson Education.
6. Connoley : Data base Systems, Pearson Education.

COMPUTER ORGANISATION AND ARCHITECTURE
PAPER CODE: MCS104

External: 80
Internal: 20   **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 additio n 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. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill.
6. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India.

DATA STRUCTURES USING C
PAPER CODE: MCS201

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 additio n 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.

OBJECT ORIENTED PROGRAMMING USING C++
PAPER CODE: MCS202

External: 80
Internal: 20   **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 additio n 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.

SOFTWARE ENGINEERING
PAPER CODE: MCS203

External: 80
Internal: 20   **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 additio n 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. , Qualit y 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; Reliabilit y Models (JM, GO, MUSA Markov), Limitations of Reliability Models.

Suggested Reading:
1. Sommerville Ian, Software Engineering, Addison Wesley
2. Satinder Bal Gupta, Software Engineering, Shree Mahavir Book (Publishers), Delhi.
3. Hoffer, George, Valacich, Modern System Analysis and Design . Pearson Education
4. Pressman S. Roger, Software Engineering, Tata McGraw-Hill.
5. Jalote Pankaj, An integrated Approach to Software, Engineering, Narosa Publishing House.
6. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.

COMPUTER NETWORKS
PAPER CODE: MCS204

External: 80
Internal: 20   **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

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 Collisio n 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.
5. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
6. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
7. Andrew S. Tanenbaum, Marten Van Steen, "Distributed Systems-Principles & Paradigms", Pearson Education.

THIRD SEMESTER

COMPUTER GRAPHICS
PAPER CODE- MCS301

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 additio n 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.

MANAGEMENT INFORMATION SYSTEM
PAPER CODE- MCS302

External: 80
Internal: 20   **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

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.

OPERATING SYSTEM AND UNIX
PAPER CODE- MCS303

External: 80
Internal: 20   **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 additio n 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.

VISUAL PROGRAMMING
PAPER CODE: MCS304

External: 80
Internal: 20   **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 additio n 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.

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.

FOURTH SEMESTER

JAVA PROGRAMMING
PAPER CODE-MCS401

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 additio n 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.

DATA WAREHOUSE AND MINING
PAPER CODE: MCS402

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 additio n 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.

INTERNET AND WEB DESIGNING
PAPER CODE- MCS403

External: 80
Internal: 20 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

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

PROJECT REPORT
PAPER CODE: MCS407

Max Marks: 100

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.