

**COURSE SCHEME & SYLLABUS FOR MCA-M.Sc. COMPUTER SCIENCE**  
**FOR THE YEAR**  
**2016-2019**

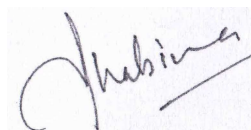
**MCA - M.Sc. Computer Science – SEMESTER-III**

**Core Courses**

Course Code	Course Title	Credits	Scheme of Examination			
			Duration	Marks		
			Hours	IA	UE	Total
MC-341	Analysis & Design of Algorithm	4	3	40	60	100
MC-342	Data Communication & Computer Networks	4	3	40	60	100
MC-343	Relational Database Management System	4	3	40	60	100
MC-344	Java Programming	4	3	40	60	100
MC-371	Lab 5: Relational Database Management System	4	3	50	50	100
MC-372	Lab 6: Java Programming	4	3	50	50	100
<b>Total Marks</b>				<b>260</b>	<b>340</b>	<b>600</b>

**IA – Internal Assessment**

**UE – University Examination**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-341	Analysis & Design of Algorithm	3	40	60	100	5	0	0	4

### Objective:

*Aim of the course is designed to acquaint the students about various algorithm design techniques, analyzing their complexities, Write rigorous proofs for algorithms, Apply important algorithmic design paradigms and methods of analysis and to Synthesize efficient algorithms in fundamental problems in computer science.*

### Unit-I

**Introduction to Algorithms**, the running times of a program. Use of the Big-Oh, Small-o, Big Omega and small Omega notations, Inequalities involving such notation, Efficiency of algorithm. Sorting Algorithms (Radix sort and Bucket sort). Introduction to algorithm design techniques.

### Unit-II

**Algorithm Analysis and Design Technique:** Analysis framework, recursive & non-recursive algorithm (Overview). Analysis of recursive and non- recursive algorithm, Strassen's Matrix multiplication, Divide and Conquer (General methods, Merge sort, Quick Sort),

### Unit-III

**Greedy Techniques:** Knapsack Problems, Prim's algorithm, Krushkal's algorithm, Dijkstra's method, Huffman trees

**Transform & Conquer:** Horner's rule & Binary Exponentiation, Problem Reduction.

**Decrease & Conquer:** Depth-First Search and Breadth-First Search, Topological sorting

### Unit-IV

**Advanced Data Structures:** Hashing & its terminology, Hash Table and Hash function, Hashing techniques, collision resolution techniques.

**Dynamic programming:** General methods, 0/1 knapsack problem, Travelling salesman problem, Warshal's and Floyd's Algorithm, Optional Binary Search trees.

### Unit-V

**Design Technique:** Back-tracking (8- Queen's Problem, Hamiltonian Cycles)

**P, NP and NP-Complete problems:** Graph Coloring, Branch and Bound, Approximation Algorithms for NP hard problems. Limitation of Algorithm-power: Lower Bound Arguments. Decision Trees.

## **COURSE OUTCOMES:**

**CO1.** For a given algorithm student will able to analyze the algorithms to determine the computational complexity and justify the correctness.

**CO2.** For a given sorting techniques (Count, Radix, Bucket, Merge, Quick) student will able to write algorithm and calculate time complexity.

**CO3.** Student will be able to solve different kind problems using Divide and Conquer algorithm, Greedy approaches and Dynamic programming.

**CO4.** Student will be familiarize with Advance Data Structures such as Hashing and different Hashing techniques.

**CO5.** Student will able to understand, distinguish and solve P, NP and NP-complete problems

*Note: The assignment or presentation component of the internal evaluation should be based on implementation of algorithms using any language*

## **Note for Paper Setting:**

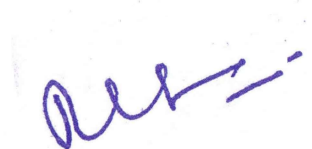
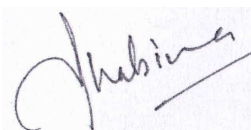
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## **Textbooks:**

1. **Anany,Levitin**, “Introduction to the Design & Analysis of Algorithm”, 2<sup>nd</sup> Edition, **Pearson Education,2007.**

## **References:**

1. **Horowitz, Ellis**, “Fundamentals of Computer Algorithms”, New Delhi, 2005, **Galgotia Publications**
2. **Leiserson, Cormen, Rivert**, “Introduction to Algorithms, , New Delhi, 2<sup>nd</sup> Edition, 2005, **PHI Publication**
3. **Brately Brassard** , “Fundamentals of Algorithms”, New Delhi, 1996, **PHI Publication**
4. **Michael T. Goodrich, Roberto Tamassia**, “Algorithm Design”, New Delhi, 2004. **Wiley Publication**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-342	Data Communication & Computer Networks	3	40	60	100	5	0	0	4

**Objective:**

*This course tries to cover fundamentals of data communication and give basic understanding of few protocols in important layers of OSI and introduce students to concepts involved in Computer networks including wired and wireless.*

**Unit-I**

**Signals:** Concept of analog and digital signals.

**Digital-to-Digital Encoding,** Line Coding, unipolar, polar (NRZ-L, NRZ-I, Manchester & Differential Manchester encoding) & bipolar, Block Coding (4B/5B), Scrambling (B8ZS Scrambling).

**Analog to digital encoding:** Pulse Amplitude Modulation, Pulse code Modulation, Delta Modulation.

**Unit-II**

**Digital to analog Modulation/ encoding:** frequency shift keying, amplitude shift keying, phase shift keying, Quadrature amplitude modulation,

**Analog-to-Analog Conversion:** Amplitude Modulation, Frequency Modulation, Phase Modulation.

**Multiplexing:** frequency division, wavelength division, time division

**Unit-III**

**Data Link Layer:** Pure Aloha, Throughput of pure Aloha, Slotted Aloha, CSMA/CD, Media Access Control in CSMA/CD, MAC Frame Format (IEEE 802.3), Format of Ethernet (DIX) Frame, The Binary Exponential Backoff Algorithm,

**Error detection:** types of errors, **detection methods:** parity check, cyclic redundancy check, checksum

**Error correction:** forward error correction, hamming code.

**Unit-IV**

**Introduction:** Computer network, LAN, MAN, WAN, Simplex, Half duplex, Full duplex,

**Transmission media:** Twisted Pair cable, Coaxial cable, Fiber optics: Multi mode & single mode (overview).

**Network topologies:** Star topology, ring topology, bus topology, mesh topology, Peer to peer network, Distributed network,

**Wireless n/w:** Bluetooth, 802.11a, b, c, n, ac series, comparison of 802.11ac & n  
**Models:** OSI Model, TCP/IP reference Model, Comparison of TCP/IP & OSI model.

### **Unit-V**

**Network layer:** Virtual circuits, Shortest path routing, Overview of (Flooding, Broadcast, Multicast IP addresses), IPv4 addresses, IPv4 subnetting, overview of IPv6 addresses, Overview of (Tunneling, Firewalls)

**Transport layer:** Quality of service, Elements of transport protocol, and Performance problems in computer networks,

**Application layer:** Basic overview of (FTP, Telnet, HTTP, Email, DNS, World Wide Web, Virtual terminal).

### **COURSE OUTCOMES:**

**CO1.** Student will be able to understand the Concept of analog and digital signals including encoding techniques.

**CO2.** Student will be able to understand the Concept of conversion techniques line, Digital to Analog, Analog to Digital, Digital to Digital, Analog to Analog.

**CO3.** Student will be able to understand the Concept of techniques involved in Data Link Layer like CSMA/CD, Error detection & error correction.

**CO4.** Student will be able to understand the Concept of Computer Networks like transmission media, Network topologies, Wireless and Network Models like OSI and TCP-IP..

**CO5.** Student will be able to understand the Concept of Network, Transport and Application Layer.

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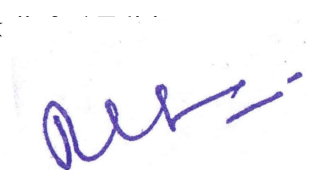
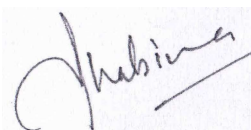
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### **Textbooks:**

1. **Tannenbaum (2004),**”Computer Networks”, Fourth Edition **PHI.**

### **References:**

1. **Behrouz A. Forouzan (2006),** “Data communication & Networks”, Fourth Edition, **TMH.**
2. **Uyless D.Black (2004),** “Data Communication & Distributed Network **PHI.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-343	Relational Database Management System	3	40	60	100	5	0	0	4

### Objective:

*The aim of the course is to introduce students to the fundamental concepts necessary for designing, using and implementing database systems. It emphasizes relational database modeling & design and the languages and facilities provided by the relational database management systems.*

### Unit-I

**Database System Concepts & Architecture:** Concept, Characteristics of database, Database system Vs file system, Introduction to DBMS, Advantages, Disadvantages of DBMS, Database users.

Database System Concept & Architecture: Concept, schemas and instances, DBMS architecture & data independence, Components of DBMS, Database Languages & Interfaces, Centralized & Client/Server Architectures of DBMSs.

### Unit-II

**Data models:** Data modeling using ER-Approach (Concept, ER-Notations, Entities, Entity types, Attributes, Attribute types, Relationships Keys concept).

Conventional Data Models & Systems: Network data model concept, Hierarchical model concept.

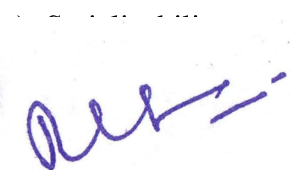
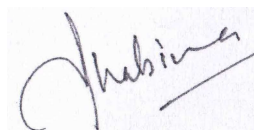
Relational Data Model: Concept, Relational model Constraints (Entity Integrity, Referential Integrity, Key Constraints, Domain Constraints), Codd's Rules, Relational Algebra (Fundamental Operations).

### Unit-III

**Relational Database Design & Normalization:** Concept of Functional dependencies (Fully, partial, Transitive), Normalization of relational database, Closure of Attribute Set, Canonical Cover, Norm forms (1NF, 2NF, 3NF, BCNF, 4NF), Join dependencies.

### Unit-IV

**Concurrency:** Concept, Transaction states, Transaction properties (ACID Test), Recoverability.

Concurrency Control & Recovery Techniques: Concurrency control concept, Concurrency control techniques, Locking (concept, types), Time stamp ordering, Granularity of data items, Dead lock & its Resolution.

Recovery Concepts, Recovery Techniques (Log based, Shadow paging, Checkpoint)

Introduction to Database Security.

Introduction to Object Oriented & Multimedia Databases.

### **Unit-V**

**PL/SQL:** Introduction, Concept, Characteristics of SQL, Advantages of SQL, Data definition in SQL, literals, Operators, Specifying Constraints in SQL, Data manipulation in SQL, Views & Queries, Insert, Update & Delete Operations, Creating users, Grant and revoke object privileges.

Introduction to PL/SQL: variable, constants, data types, PL/SQL block structure, Condition and iterative control statements, Concept of cursors & trigger.

### **COURSE OUTCOMES:**

CO1: Distinguish database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit. The student shall also be able to define the terminology, features, classifications, and characteristics embodied in database systems.

CO2: Model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model and also demonstrate an understanding of the relational data model and also Formulate, using relational algebra, solutions to a broad range of query problems.

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database. The students shall know why normalization and what role it plays in the database design process and also its various normal forms 1NF, 2NF, 3NF, BCNF, and 4NF.

CO4: Determine the Acid properties (Atomicity, Consistency, Isolation and Durability) of a given Transaction and also explore the various locking protocols and database backup and recovery mechanisms so as to implement the same in the real world.

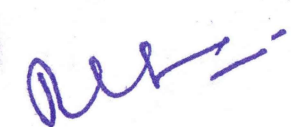
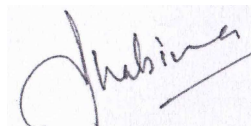
CO5: write various DDL/DML/DCL SQL commands to insert/update/delete data, and query data in a relational DBMS. Students shall solve a broad range of query and data update problems.

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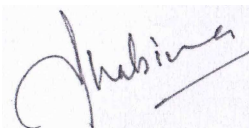

1. Elmars, Navathe, S B (2004), "Fundamentals of database Systems", I

2. **Silbebschatz, A. Korth, H.F. Sudarshan ,S (2006)** ,“Database System Concepts”, **TMH .**

**References:**

1. **Date, C J (2005)**, “An Introduction to Database Systems”, **Addison Wesley.**
2. **Desai, B C (2002)**, “An introduction to database Systems”, **Galgotia Publications.**
3. **Leon (2004)**, “Database Management Systems”, **Vikas Publications.**
4. **Bayross I.**, “Commercial Application Development using Oracle Developer 2000”, **BPB.**





Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-344	Java Programming	3	40	60	100	5	0	0	4

### Objective:

*This course acquaints students with object oriented programming concepts and other advanced features and their implementation in Java language.*

### Unit-I

**Introduction:** An overview to Java, Comparison with other languages (C & C++), Java and Internet, Features of Java, Introduction to Java Virtual machine, Object Oriented Programming Concepts: Abstraction, Encapsulation, Inheritance and Polymorphism.

**Data types:** Integers, Floating point, Character type and Boolean.

**Variables:** Assignment, Initialization, type conversion & Casting.

**Operators:** Arithmetic, Assignment, Modulus, Relational, Boolean and Bitwise.

### Unit-II

**Arrays:** Concept, Single and Multidimensional arrays.

**Control statements:** Conditional statements, Iteration Statements and Jump Statements.

**Classes & Methods:** Class Fundamentals, Declaring Objects, Creating Methods, Constructors, Command Line Arguments & Argument Passing. Static variables and methods.

### Unit-III

**Inheritance:** Basics Of Inheritance, Super Class, Member Access, Creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch & Abstract Class.

**Packages & Interfaces:** Defining and Importing Packages, Understanding Classpath, Access Protection, Defining and Implementing Interfaces.

**Exception Handling:** Fundamentals of Exceptions, Exception Types, Using Try and Catch, Throwing Exceptions, Built-In Exceptions in Java, User Defined Exceptions.

### Unit-IV

**Multithreaded Programming:** Java Thread Model, Creating & Working with Threads, Thread Priorities, Introduction to Synchronization and Dead Locks.

**String Handling:** String Constructor, String Operations, Character Extraction, String Searching & Comparison, String Buffer Class, String Buffer V/s String Class.

**Lang Package:** Simple Type Wrappers, Runtime & Introduction To Memory Management.

### Unit-V

**I/O Streams:** Stream Classes, Reading & Writing to Console, Accessing File Input and Output Stream, Byte Array Input & Output Stream.

**Applets:** Overview, Life cycle of an Applet, HTML tag, Parameter Passing, Applet vs. Applications.

**COURSE OUTCOMES:**

- CO1.** Students will be able to understand the features of java and how does work with data types, variables and operators in Java Virtual Machine (JVM) Environment.
- CO2.** Students shall be able to work with Arrays, Use of Control Statements and Fundamentals of Class & Objects.
- CO3.** Students will be to implement the features of Inheritance, Packages, Interfaces and Exception Handling in Java programming.
- CO4.** Students shallt be able to program with multithreading programming style, Lang Package and Handling of Strings in Java.
- CO5.** Students shall be able to program with Input Output (I/O) Streams and development of Applets.

**Note for Paper Setting:**

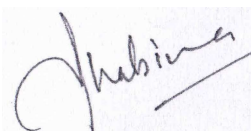
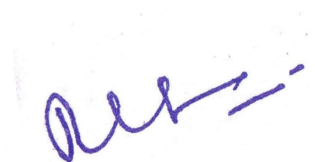
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**Text Books:**

- 1. **Schildt, H (2004)**, “The Complete Reference Java-2 “, Sixth Edition, **TMH**.

**References:**

- 1. **Dietel & Dietel (2006)**, “Java: How to Program Java 2”, Sixth Edition, **Pearson Education**.
- 2. **Horstmann & Cornell (2006)**, “Java2 Vol-1 & Vol-2”, Seven Indian Reprint, **Pearson Education**.



Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-371	Lab 5: Relational Database Management System	3	50	50	100	0	0	6	4


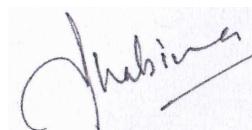
### **COURSE OUTCOMES:**

**CO1:** Student shall be able to write various DDL/DML/DCL SQL commands to insert/update/delete data in/from the table(s).

**CO2:** Student shall be able to write various queries to extract the data from the table(s) based on the problem in hand.

**CO3:** Student shall be able to Implement locking techniques on the databases.

**CO4:** Student shall be able to write various PL/ SQL Blocks to work on Functions, Cursors, and Triggers.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-372	Lab 6: Java Programming	3	50	50	100	0	0	6	4

**COURSE OUTCOMES:**

**CO1.** The Technical and Programming skills of students will develop in java programming.

**CO2.** Students will be able to develop the Application Software.

**CO3.** Students will be able to work with pure object oriented programming environment.

**CO4.** Students will be able to develop multi-threaded Application Programs.

**CO5.** Students will be able to work with Applets.

