

# TECHNOCRATS INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to RGPV Bhopal)

## DEPARTMENT OF COMPUTER APPLICATIONS

Semester	I	Program		MCA					
Subject Code:	MCA-201	Subject Name	Data Base Management System						
Maximum Marks Allotted						Contact Hours		Total Credits	
ES	MS	Assignment/Quiz	ES	LW	Total Marks	L	T		
70	20	10	-	-	100	2	1	-	3

UNITS	Descriptions
I	<b>Introduction:</b> Advantage of DBMS approach, various view of data, data independence, schema and subschema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture. <b>ER model:</b> basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.
II	<b>Domains, Relations and Keys:</b> domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. <b>Relational Algebra &amp; SQL:</b> The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, modification of Database, join relations, DDL in SQL.
III	<b>Functional Dependencies and Normalization:</b> basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multi valued dependencies and fourth normal form, Join dependency and fifth normal form.
IV	Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL. Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage

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	implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints. <b>Distributed Database:</b> basic idea, distributed data storage, data replication, data fragmentation horizontal, vertical and mixed fragmentation
V	<b>Emerging Fields in DBMS:</b> object oriented Databases-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing- terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval, continuous media data, multimedia data formats, video servers. <b>Storage structure and file organizations:</b> overview of physical storage media, magnetic disks performance and optimization, basic idea of RAID, file organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparison of the three models.

#### Reference Books-

1. A Silberschatz, H.F Korth, Sudersan "Database System Concepts" –, MGH Publication.
2. C.J Date "An introduction to Database Systems" –6th ed.
3. Elmasri & Navathe "Fundamentals of Database systems" – III ed.
4. B.C. Desai. "An introduction to Database systems" BPB
5. Raghurama Krishnan "Database Systems" TMH

Note : Paper is to be set unit wise with internal choice.

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## DEPARTMENT OF COMPUTER APPLICATIONS

Semester	I	Program		MCA				
Subject Code:	MCA-202	Subject Name	Java Programming & Technologies					
Maximum Marks Allotted						Contact Hours		Total Credits
Theory			Practical		Total Marks	L		
ES	MS	Assignment/Quiz	ES	LW		L	T	
70	20	10	-	-	100	2	1	-

UNITS	Descriptions
I	<p><b>The Java Environment:</b> History of Java; Comparison of Java and C++; Java as an object oriented language; Java buzzwords; A simple program, its compilation and execution; the concept of CLASSPATH; Basic idea of application and applet;</p> <p><b>Basics:</b> Data types; Operators- precedence and associativity; Type conversion; The decision making – if, if ..else, switch; loops – for, while, do...while; special statements–return, break, continue, labeled break, labeled continue; Modular programming methods; arrays; memory allocation and garbage collection in java keywords.</p> <p><b>Object Oriented Programming in Java:</b> Class; Packages; scope and lifetime; Access specifies; Constructors; Copy constructor; this pointer; finalize () method; arrays; Memory allocation and garbage collection in java keywords</p> <p><b>Inheritance :</b> Inheritance basics, method overriding, dynamics method dispatch, abstract classes.</p>
II	<p><b>Interfaces :</b> defining an interface, implementing &amp; applying interfaces, variables in interfaces, extending interfaces.</p> <p><b>Multithreading and Exception Handling:</b> Basic idea of multithreaded programming; The lifecycle of a thread; Creating thread with the thread class and runnable interface; Thread synchronization; Thread scheduling; Producer-consumer relationship; Daemon thread, Selfish threads; Basic idea of exception handling; The try, catch and throw; throws Constructor and finalizers in exception handling; Exception Handling.</p>
III	<p><b>Applets:</b> Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet.</p> <p><b>The AWT:</b> The class hierarchy of window fundamentals; The basic user interface</p>

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	<p>components Label, Button, Check Box, Radio Button, Choice menu, Text area, Scroll list, Scroll bar; Frame; Layout managers flow layout, Grid layout, Border layout, Card layout.</p> <p><b>The Java Event Handling Model:</b> Java's event delegation model – ignoring the event, Self contained events, Delegating events; The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Mouse Event, Text Event, Window Event.</p>
IV	<p><b>Input/Output :</b> Exploring Java i.o., Directories, stream classes</p> <p>The Byte stream : Input stream, output stream, file input stream, file output stream, print stream, Random access file, the character streams, Buffered reader, buffered writer, print writer, serialization.</p> <p><b>JDBC:</b> JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating the result set object contents; java.sql Package; The JDBC exception classes; Connecting to Remote database.</p>
V	<p><b>Networking &amp; RMI:</b> Java Networking : Networking Basics : Socket, Client server, reserved sockets, proxy servers, Inet address, TCP sockets, UDP sockets. ; RMI for distributed computing; RMI registry services; Steps of creating RMI Application and an example.</p> <p><b>Collections:</b> The collections framework, collection interfaces, collection classes.</p>

#### Reference Books-

1. Naughton & Schildt "The Complete Reference Java 2", Tata McGraw Hill
2. Deitel "Java- How to Program:" Pearson Education, Asia
3. Horstmann & Cornell "Core Java 2" (Vol I & II ), Sun Microsystems
4. Ivan Bayross "Java 2.0" : BPB publications
5. Ivor Horton's "Beginning Java 2, JDK 5 Ed., Wiley India.

Note : Paper is to be set unit wise with internal choice.

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## DEPARTMENT OF COMPUTER APPLICATIONS

Semester	I	Program		MCA							
Subject Code:	MCA-203	Subject Name	Computer Networks								
Maximum Marks Allotted							Total Marks	Contact Hours			Total Credits
Theory			Practical		Total Marks	L	T	P			
ES	MS	Assignment/Quiz	ES	LW							
70	20	10	-	-	100	2	1	-	3		

UNITS	Descriptions
I	Introduction: Computer Network, Layered Network Architecture-Review of ISO-OSI Model, Transmission Fundamentals-, Communication Media-Conductive Metal (Wired Cable), Optical Fiber links, Wireless Communication-Radio links, Satellite Links, Communication Services & Devices, Telephone System., Integrated Service Digital Network (ISDN)., Cellular Phone., ATM. Network Security, Virtual Terminal Protocol, Overview of DNS, SNMP, email, WWW, Multimedia.
II	Data Security and Integrity: Parity Checking Code, Cyclic redundancy checks (CRC), Hemming Code, Protocol Concepts –, Basic flow control, Sliding window protocol-Go-Back-N protocol and selective repeat protocol, Protocol correctness-Finite state machine
III	Local Area Network: Ethernet : 802.3 IEEE standard, Token Ring : 802.5 IEEE standard, Token Bus : 802.4 IEEE standard, FDDI Protocol, DQDB Protocol, Inter Networking, Layer 1 connections- Repeater, Hubs, Layer 2 connections- Bridges, Switches, Layer 3 connections- Routers, Gateways.
IV	Wide Area Network: Introduction, Network routing, Routing Tables, Types of routing, Dijkstra's Algorithm, Bellman-Ford Algorithm, Link state routing, Open shortest path first, Flooding, Broadcasting, Multicasting, Congestion & Dead Lock, Internet Protocols, Overview of TCP/IP, Transport protocols, Elements of Transport Protocol, Transmission control protocol (TCP), User data-gram protocol (UDP).
V	Wireless Broadband Networks Technology Overview, Platforms and Standards: Wireless broadband fundamentals and Fixed Wireless Broadband Systems, Platforms- Enhanced Copper, Fibre Optic and HFC, 3G Cellular, Satellites, ATM and Relay Technologies, HiperLAN2 Standard, Global 3G CDMA Standard,

CDMA Harmonization G3G Proposal for Protocol Layers.

**Reference Books-**

1. A.S.Tanenbaum, "Computer Network", 4th addition, PHI
2. Forouzan "Data Communication and Networking 3ed", TMH
3. J.F.Hayes, "Moduling and Analysis of Computer Communication Networks", Plenum Press
4. D.E.Comer, "Internetworking with TCP/IP", Volume Ist & IIInd, PHI
5. Willium Stalling, "Data & Computer communications", Maxwell Macmillan International Ed.
6. D.Bertsekas and R.Gallager, "Data Networks", 2nd Ed. , PHI.
7. G.E. Keiser, "Local Area Networks ", McGraw Hill, International Ed.
8. Joh R. Vacca, "Wireless Broadband Networks Handbook 3G, LMDS and Wireless Internet" Tata McGraw-Hill, 2001

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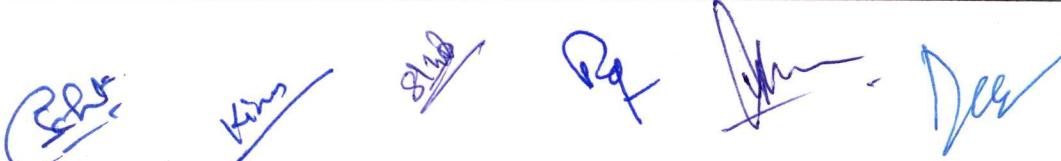
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## DEPARTMENT OF COMPUTER APPLICATIONS

Semester	I	Program		MCA				
Subject Code:	MCA-204	Subject Name	Analysis and Design of Algorithms					
Maximum Marks Allotted						Contact Hours		Total Credits
Theory			Practical		Total Marks	L		
ES	MS	Assignment/Quiz	ES	LW		L	T	
70	20	10	-	-	100	2	1	-

UNITS	Descriptions
I	<b>Pre-requisites:</b> Data structure & Discrete structures, models of computation, algorithm analysis, order architecture, time space complexities average and worst case analysis.
II	<b>Divide and conquer:</b> Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Strassen's Multiplication; Analysis of divide and conquer run time recurrence relations. Graph Traversals – BFS and DFS, Applications of graphs - shortest-path algorithms - Dijkstra's algorithm, Bellman-Ford algorithm, minimum spanning tree – Prim's and Kruskal's algorithms. Basic idea of AVL tree-definition, insertion & deletion operations, basic idea of Btree- definition, order, degree, insertion & deletion operations, B+-Tree- definitions, comparison with B-tree
III	<b>Greedy Method:</b> Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths. <b>Branch and bound:</b> LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem, searching & sorting algorithms.
IV	<b>Dynamic programming:</b> Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix multiplication, Traveling salesman Problem, longest Common sequence. <b>Back tracking:</b> Overview, 8-queen problem, and Knapsack problem

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V

**Computational Complexity:** Complexity measures, polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, examples. Combinational algorithms, string processing algorithm, Algebraic algorithms, set algorithms

**Reference Books-**

1. Ullman "Analysis and Design of Algorithm" TMH
2. Goodman "Introduction to the Design & Analysis of Algorithms, TMH-2002.
3. Sara Basse, A. V. Gelder, " Computer Algorithms," Addison Wesley
4. T. H. Cormen, Leiserson , Rivest and Stein, "Introduction of Computer algorithm," PHI
5. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication

Note : Paper is to be set unit wise with internal choice.

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## DEPARTMENT OF COMPUTER APPLICATIONS

Semester	I	Program		MCA				
Subject Code:	MCA-205	Subject Name	Statistics and Machine Learning					
Maximum Marks Allotted						Contact Hours		Total Credits
Theory			Practical		Total Marks	L		
ES	MS	Assignment/Quiz	ES	LW		T	P	
70	20	10	-	-	100	2	1	-

UNITS	Descriptions
I	<b>Basic Statistics:</b> Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.
II	<b>Applied Statistics:</b> Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.
III	<b>Basic Probability:</b> Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.
IV	<b>Introduction to machine learning:</b> Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis function and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.
V	<b>Linearity:</b> Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, backpropagation,

weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters,

**Reference Books-**

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer-Verlag New York Inc., 2nd Edition, 2011.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, First edition, 2017.
3. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016

