LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) **Semester - II** **wef: July 2025**

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
RDBMS	MCA-201	3	1	0	80	20	100

Course Objective	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Units	Contents (*Theory*)	Hours /week
I	**Introduction:** 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.ER model: 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.	8
II	**Domains, Relations and Keys:** domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. **Relational Algebra & SQL:** Features of good relational database design, Codd's rule, The structure, relational algebra with extended operations, modifications of Database, , basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, join relations, DDL in SQL.PL/SQL programming: working with stored procedures, triggers, cursor Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.	8
III	**Functional Dependencies and Normalization:** 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.	8
IV	**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 implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints. Distributed Database: basic idea, distributed data storage, data replication, data fragmentation: horizontal, vertical and mixed fragmentation.	8

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

V	**Emerging Fields in DBMS:** 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. Storage structure and file organizations: overview of physical storage media, magnetic disk 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. **NoSQL:** Introduction to NoSQL, Types of NoSQL Databases, Data Models and Query Languages, Use Cases and Applications.	8

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A Silberschatz, H.F Korth, Sudersan	Database System Concepts	VI	MGH Publication
C.J Date	An introduction to Database Systems	VI	Addison-Wesley
Elmasri & Navathe	Fundamentals of Database systems	VII	Pearson
Raghurama Krishnan	Database Systems	III	TMH

COURSE OUTCOMES: Students will be able to

CO1	Extract the basic principles of database management systems and Draw ER diagrams to represent simple database application scenarios.
CO2	Correlate relations, keys, relational algebra and SQL and write SQL queries for a given context in relational database.
CO3	Contrast normalization techniques with simple examples.
CO4	Judge transaction processing and concurrency control concepts.
CO5	Write the various systematic database design approaches.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
JAVA Technologies	MCA-202	3	1	0	80	20	100

Course Objective	To teach programming in the Java language, give knowledge of object-oriented paradigm in the Java programming language to teach the use of Java in a variety of technologies and on different platforms.

Units	Contents (Theory)	Hours /week
I	**OOP concepts** – Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism. **The Java Environment:** Setting Class path; Data types; Operators - precedence and associativity; Type conversion; Control and Iterative statements; Modular programming methods; **Object Oriented Programming in Java:** Class; Objects; Packages; Scope and lifetime; Access Modifiers; Constructors; Copy constructor; this pointer; finalize() method; Arrays; Memory allocation and garbage collection **Inheritance:** Inheritance basics, method overriding, dynamics method dispatch, abstract classes. **Interfaces:** Defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces.	8
II	**Multithreading and Exception Handling:** 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; The try, catch and throw; throws Constructor and finalizers in exception handling; Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet.	8
III	**Input/Output:** Exploring Java I/O, Directories, stream classes 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. **JDBC:** 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. **Collections:** The collections framework, collection interfaces, collection classes.	8

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

IV	**AWT Fundamentals:** The class hierarchy of window fundamentals; The basic user interface components, Frame, Layout managers, flow layout etc. **The Java Event Handling Model:** Java's event delegation model, Event class hierarchy; Adapter classes; Event classes action and different Events **SWINGS:** Introduction, Hierarchy of swing components. Containers, Top level containers -JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JScrollPane.	8
V	**Introduction of Web Designing:** HTML basics Servlets Overview, Servlet Lifecycle: init(), service(),destroy(), Generic Servlet, Servlet Request, and Servlet Response, http Servlet Request, http Servlet Response and http Servlet, Requestresponse, headers, GET, POSTJSP: JSP architecture, JSP tags and JSP expressions, Fixed Template Data ,Lifecycle of a JSP, Model View Controller (MVC), Files and applets in jsp Pages, using java beans components in JSP documents. **Struts Framework:** Struts Architecture, Struts classes ActionForward, ActionForm, ActionServlet, Action classes, Understanding struts config. Xml, Understanding ActionMappings, Struts flow with an example application.	8

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Naughton & Schildt	The Complete Reference Java 2	1st	Tata Mc Graw Hill
Deitel	Java- How to Program	Vol. I &II	Pearson Education
Horstmann & Cornell	Core Java 2	Vol. I &II	Sun Microsystems
E.R. Harold, SPD	Java Network Programming	III edition	O'Reilly Media, Inc.

COURSE OUTCOMES: Students will be able to

CO1	Articulate the basic concepts of object oriented programming in java.
CO2	Categorize different exception handling mechanism.
CO3	Judge use of I/O stream and Database connectivity model.
CO4	Apply AWT and Java Swings for designing GUI applications
CO5	Write the basics of Web Designing and Struct framework**.**

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) **Semester - II** **wef: July 2025**

Name of Paper	Paper Code	Theory					
		Credit			Marks		
Discrete Mathematics	MCA-203	L	T	J	EST	CAT	Total
		3	1	0	80	20	100

Course Objective	The objective of this course is to provide an understanding on knowledge of Discrete Mathematics and inculcate the concepts of Graphs.

Units	Contents (*Theory*)	Hours /week
I	**Introduction to Discrete Mathematical Structures:** Sets, Relations and functions-Sets, Types of Sets, Multisets, Operations on Sets, Relations and Properties of Relations, Representation of Relations, Equivalence Relation, Closures of Relations, Functions, injection, Surjection and Bijective mapping, Composition of functions, Introduction to characteristic functions	8
II	**Fundamentals of Logic:** Proposition, Logical Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference; The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems	8
III	**Trees:** Properties of trees; Pendant vertices in a tree: Center of a tree; Rooted an binary trees; Spanning Trees – spanning tree algorithms; Fundamental circuits; Spanning trees of a weighted graph, cutsets and cut – Vertices; Fundamental cutsets; connectivity and separativity.	8
IV	**Graph Theory:** Types of Graphs, Path and Circuits, Eulerian Path and Circuits, Hamiltonian Path and Circuits, Shortest Path Algorithms	8
V	**Group:** Definitions and Properties, Coset & Subgroup, Normal subgroup, Homomorphism of groups, Cyclic Group, Permutation Group. Matrix Algebra: Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigenvectors-Inverse of a Matrix - Cayley Hamilton Theorem	8

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Kenneth H. Rosen	Discrete Mathematics and its Applications	8th	McGraw Hill
Kolman, Busby & Ross	Discrete Mathematical Structures	6th	PHI
Narsingh Deo,	Graph Theory With Application to Engineering and Computer Science	1st	PHI
Vinay Kumar	Discrete Mathematics	1st	BPB Publications
Trembly J.P. & Manohar P.	Discrete Mathematical Structures with Applications to Computer Science	1st	McGraw Hill

COURSE OUTCOMES: Students will be able to

CO1	Describe useful standard library functions, create functions, and declare parameters
CO2	Explain the laws of logic.
CO3	Find spanning trees of a graph.
CO4	Find shortest and Hamiltonian path.
CO5	Calculate Eigen values of equations

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Soft Skill & Entrepreneurship	MCA-204	3	1	0	80	20	100

Course Objective	The objective of this course to teach students basics of communication and to enhance their communication skills.

Units	Contents (*Theory*)	Hours /week
I	**Listening:** Barriers of Listening skill -Approaches to Listening –How to improve Listening exercises. Speaking: Paralanguage: Sounds, stress, intonation - Art of conversation – Presentation skills – Public speaking - Expressing Techniques.	8
II	**Reading:** Kinds of Reading – Causes of reading difficulties – Reading strategies – exercises. Writing: Effective writing– Paragraph, Essay, Reports, Letters, Articles, Notices, Agenda & Minutes.	8
III	**Communication:** Modes of Communication - Barriers – Interpersonal skills, Negotiation skills Non- Verbal communication – Etiquettes.	8
IV	**Group Dynamic Skills:** Group Discussion– Team building & Team work – Be a manager or leader – Decision making – creativity – Time & Stress management skills.	8
V	**Interview Skills:** Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview, Mock Interview _ Quick Tips.	8

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Sanghi Seema	Improve your communication skills	2nd	Wiley
Dr. Alex, K.	Soft Skill: know yourself & Know the world	1st	Pearson
Ashley, Roderic	How to enhance your employability	2019	Kogan Page

COURSE OUTCOMES: Students will be able to

CO1	Infer critical and innovative thinking.
CO2	Illustrate oral, written, and visual communication.
CO3	Categorize communication barriers
CO4	Role play group discussion and stress management
CO5	Write different types of interviews.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Design and Analysis of Algorithms	MCA-205	3	1	0	80	20	100

Course Objective	The objectives of this course are to apply important algorithmic design paradigms and methods of analysis.

Units	Contents (*Theory*)	Hours /week
I	**Introduction to Algorithms and Analysis:** Overview and importance of algorithms and data structures. Fundamentals of algorithm analysis, Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Mathematical Analysis of non-recursive and recursive algorithms, Asymptotic analysis for recurrence relation – Recursive Tree Method.	8
II	**Divide and conquer:** Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Strassen's Multiplication; Analysis of divide and conquer run time recurrence relations. Graph searching and Traversal: Overview, Traversal methods (depth first and breadth first search)	8
III	**Greedy Method:** Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths. Branch and bound: LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem, searching & sorting algorithms.	8
IV	**Dynamic programming:** Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix multiplication, Traveling salesman Problem, longest Common sequence. Back tracking: Overview, 8-queen problem, and Knapsack problem	8
V	**Computational Complexity:** Complexity measures, Polynomial Vs Non-polynomial time complexity; NP-hard and NP-complete classes, examples. Combinational algorithms, string processing algorithm, Algebric algorithms , set algorithms	8

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Ullman	"Analysis and Design of Algorithm"	1st	TMH
Goodman	"Introduction to the Design & Analysis of Algorithms	2nd	TMH-2002
Sara Basse, A. V. Gelder	Computer Algorithms	1st	Addison Wesley
T. H. Cormen, Leiserson, Rivest and Stein	Introduction of Computer algorithm	3rd	PHI
E. Horowitz, S. Sahni, and S. Rajsekaran	Fundamentals of Computer Algorithms	2008	Galgotia Publication

COURSE OUTCOMES: Students will be able to

CO1	Illustrate complexities of algorithms.
CO2	Design algorithms using divide and conquer, greedy and dynamic programming.
CO3	Solve knapsack problem and apply branch and bound techniques.
CO4	Apply the dynamic programming technique to solve real world problems such as knapsack and TSP, 8 Queens problem etc.
CO5	Rewrite NP hard problems.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) **Semester - II** **wef: July 2025**

Name of Paper	Paper Code	Practical				
		Credit		**Marks**		
Lab in RDBMS	**MCA-206**	**P**	**J**	**ESP**	**CAP**	**Total**
		8	0	120	80	200

Contents:

Create the following Databases.

Salesmen

SNUM SNAME CITY COMMISSION

1001 Piyush London 12 %

1002 Sejal Surat 13 %

1004 Miti London 11 %

1007 Rajesh Baroda 15 %

1003 Anand New Delhi 10 %

SNUM : A unique number assigned to each salesman.

SNAME : The name of salesman.

CITY : The location of salesmen.

COMMISSION: The Salemen's commission on orders.

Customers

CNUM CNAME CITY RATING SNUM

2001 Harsh London 100 1001

2002 Gita Rome 200 1003

2003 Lalit Surat 200 1002

2004 Guni Bombay 300 1002

2006 Chirag London 100 1001

2008 Chinmay Surat 300 1007

2007 Pratik Rome 100 1004

CNUM : A unique number assigned to each customer.

CNAME : The name of the customer.

CITY : The location of the customer.

RATING : A level of preference indicator given to this customer.

SNUM : The number of salesman assigned to this customer.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) Semester - II wef: July 2025

Orders

ONUM	AMOUNT	ODATE	CNUM	SNUM
3001	18.69	10/03/97	2008	1007
3003	767.19	10/03/97	2001	1001
3002	1900.10	10/03/97	2007	1004
3005	5160.45	10/03/97	2003	1002
3006	1098.16	10/03/97	2008	1007
3009	1713.23	10/04/97	2002	1003
3007	75.75	10/04/97	2004	1002
3008	4723.00	10/05/97	2006	1001
3010	1309.95	10/06/97	2004	1002
3011	9891.88	10/06/97	2006	1001

ONUM : A unique number assigned to each order.

AMOUNT : The amount of an order.

ODATE : The date of an order.

CNUM : The number of customer making the order.

SNUM : The number of salesman credited with the sale.

Write queries :-

1. Produce the order no, amount and date of all orders.
2. Give all the information about all the customers with salesmannumber 1001.
3. Display the following information in the order of city, sname, snumand commission.
4. List of rating followed by the name of each customer in Surat.
5. List of snum of all salesmen with orders in order table without anyduplicates.
6. List of all orders for more than Rs. 1000.
7. List of names and cities of all salesmen in London with commissionabove 10%.
8. List all customers whose names begins with a letter 'C'.
9. List all customers whose names begins with letter 'A' to 'G'.
10. List all orders with zero or NULL amount.
11. Find out the largest orders of salesman 1002 and 1007.
12. Count all orders of October 3, 1997.
13. Calculate the total amount ordered.
14. Calculate the average amount ordered.
15. Count the no. of salesmen currently having orders.
16. List all salesmen with their % of commission.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) **Semester - II** **wef: July 2025**

17. Assume each salesperson has a 12% commission. Write a query on theorder table that will produce the order number, salesman no and theamount of commission for that order.
18. Find the highest rating in each city in the form :For the city (city), the highest rating is : (rating)
19. List all in descending order of rating.
20. Calculate the total of orders for each day and place the result indescending order.
21. Show the name of all customers with their salesman's name.
22. List all customers and salesmen who shared a same city.

LNCT UNIVERSITY, BHOPAL

Programme:- MCA (CA) **Semester - II** **wef: July 2025**

Name of Paper	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Programming Lab in JAVA	MCA-207	2	0	30	20	50

Content :-

1. Installation of J2SDK
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONTRUCTOR
10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.