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

Name of Paper	Paper Code	Theory					
		Credit			Marks		
RDBMS	MAI-201	L	T	J	EST	CAT	Total
		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	8

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	recovery, deferred Database modification, immediate Database modification, checkpoints. Distributed Database: basic idea, distributed data storage, data replication, data fragmentation: horizontal, vertical and mixed fragmentation.	
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	MGHPublication
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.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
JAVA Technologies	MAI-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	8

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	classes.	
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**.**

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Statistical Modelling and Data Reasoning with Python	MAI-203	3	1	0	80	20	100

Course Objective	• Understand fundamental statistical concepts and techniques for data summarization and analysis. • Apply probability theory and distributions in modeling and interpreting real-world data. • Explore and analyze random variables, expectations, and joint distributions. • Learn methods of point and interval estimation for parameters in statistical models. • Conduct hypothesis testing and perform Bayesian and frequentist inference using Python.

Units	Contents (*Theory*)	Hours /week
I	**Introduction to Statistics:** Introduction to Statistics. Role of statistics in scientific methods, current applications of statistics. **Scientific data gathering**: Sampling techniques, scientific studies, observational studies, data management. **Data description:** Displaying data on a single variable (graphical methods, measure of central tendency, measure of spread), displaying relationship between two or more variables, measure of association between two or more variables.	8
II	**Probability Theory:** Sample space and events, probability, axioms of probability, independent events, conditional probability, Bayes' theorem.	8
III	**Random Variables:** Discrete and continuous random variables. Probability distribution of discrete random variables, binomial distribution, poisson distribution. Probability distribution of continuous random variables, The uniform distribution, normal (gaussian) distribution, exponential distribution, gamma distribution, beta distribution, t-distribution, χ" distribution. Expectations, variance and covariance. Probability Inequalities. Bivariate distributions	8
IV	**Point Estimations:** Methods of finding estimators, method of moments, maximum likelihood estimators, bayes estimators. Methods of evaluating estimators, mean squared error, best unbiased estimator, sufficiency and unbiasedness **Interval Estimations:** Confidence interval of means and proportions, Distribution free confidence interval of percentiles	8
V	**Test of Statistical Hypothesis and p-values: Tests** about one mean, tests of equality of two means, test about proportions, p-values, likelihood ratio test, Bayesian tests **Bayesian Statistics:** Bayesian inference of discrete random variable, Bayesian	8

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	inference of binomial proportion, comparing Bayesian and frequentist inferences of proportion, comparing Bayesian and frequentist inferences of mean **Univariate Statistics using Python:** Mean, Mode. Median, Variance, Standard Deviation, Normal Distribution.	

Text Books/ ReferencesBook:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
David S. Moore, George P. McCabe, Bruce A. Crai	Introduction to the Practice of Statistics	9th	W.H. Freeman
Ronald E. Walpole et al.	Probability and Statistics for Engineers and Scientists	9th	Pearson
Allen B. Downey	Think Stats: Probability and Statistics for Programmers	2nd	O'Reilly Media
Larry Wasserman	All of Statistics	1st	Springer

COURSE OUTCOMES: Students will be able to

CO1	Explain descriptive statistics, data collection techniques, and measures of association.
CO2	Apply probability rules, conditional probability, and Bayes' theorem to solve problems.
CO3	Use probability distributions and evaluate expectations, variances, and joint distributions.
CO4	Estimate parameters using various techniques and construct confidence intervals.
CO5	Perform hypothesis testing and compare Bayesian and frequentist methods using Python.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Soft Skills & Entrepreneurship	MAI-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

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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 sill: 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.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Visualization	MAI-205	3	1	0	80	20	100

Course Objective	• Introduce fundamental concepts of data analysis and data handling for effective data interpretation. • Familiarize students with data visualization techniques using Excel and Power BI. • Equip students with logical, statistical, and financial functions for data-driven decision-making. • Develop skills in advanced visual tools like Power Map, Heat Map, Tree Map, Gantt, and Pareto charts. • Apply correlation, regression, and What-If analysis using Pivot Tables, Slicers, and data modeling tools.

Units	Contents (*Theory*)	Hours /week
I	INTRODUCTION TO DATA HANDLING Overview of Data analysis, Introduction to Data visualization, Working with statistical formulas - Logical and financial functions.	8
II	Power BI Analytics, Data Validation & data models, Power Map for visualize data , Power BI-Business Intelligence , Data Analysis using statistical methods, Dashboard designing.	8
III	INTRODUCTION TO DATA MANIPULATION USING FUNCTION: Heat Map, Tree Map, Smart Chart, Azure Machine learning , Column Chart, Line Chart , Pie,Bar, Area, Scatter Chart, Data Series, Axes , Chart Sheet , Trendline , Error Bars, Sparklines, Combination Chart, Gauge, Thermometer Chart. Gantt Chart , Pareto Chart etc , Frequency Distribution, Pivot Chart, Slicers , Tables: Structured References, Table Styles , What-If Analysis: Data Tables| Correlation model |Regression model	8
IV	**Data Strategy & Consumer behaviour Analytics:** Understanding Product & Category, Competitive Analysis, Market Share understanding- Market potential Index, Seasonality-Sales Trending, Consumer behaviour Analytics-MIND AND MARKET FACTORS.Budget planning & Execution- MIMI, Regression & Correlation Analysis for Sales trending, Forecasting method with predictive investment modelling, Cohort Analysis, Google Analytics(GA), Case Studies-Assignments.	8

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V	**TABLEAU SOFTWARE: GETTING STARTED WITH TABLEAU SOFTWARE:** What is Tableau? What does? the Tableau product suite comprise of? How Does Tableau Work? Tableau Architecture, What is my Tableau Repository? Connecting to Data & Introduction to data source concepts ,Understanding the Tableau workspace, Dimensions and Measures, Data Types & Default Properties, Building basic views, saving and Sharing your work-overview. Introduction to Qlikview and other tools.	8

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. Christian Albright, Wayne L. Winston	Data Analysis and Decision Making	6th	Cengage Learning
Adam Aspin	Data Visualization with Microsoft Power BI	2nd	Apress
S. Christian Albright, Wayne L. Winston	Business Analytics: Data Analysis & Decision Making	7th	Cengage Learning
Jinjer Simon	Excel Data Analysis: Your Visual Blueprint for Analyzing Data, Charts, and PivotTables	3rd	Wiley
Brett Powell	Mastering Power BI	2nd	Packt Publishing

COURSE OUTCOMES: Students will be able to

CO1	Illustrate the fundamentals of data analysis and data handling techniques.
CO2	Apply various data visualization tools using Excel and Power BI.
CO3	Utilize logical, statistical, and financial functions for analytical purposes.
CO4	Create advanced charts and visualizations like Heat Map, Tree Map, Gantt, and Pareto.
CO5	Perform correlation, regression, and What-If analysis using modern data modeling tools.

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Name of Paper	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Lab in RDBMS	MAI-206	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.

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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.

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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.

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Name of Paper	Paper Code	Practical				
		Credit		Marks		
Programming Lab in JAVA	**MAI-207**	**P**	**J**	**ESP**	**CAP**	**Total**
		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.