ADVANCE DATABASE MANAGEMENT **Course Code : 315324**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Data Sciences/ Information Technology/ Computer Science & Information Technology**
Programme Code	**: AI/ AN/ DS/ IF/ IH**
Semester	**: Fifth**
Course Title	**: ADVANCE DATABASE MANAGEMENT**
Course Code	**: 315324**

I. RATIONALE

Advance Database Management Systems (ADBMS) encompass a wide range of topics related to database systems, including their design and management. This course curriculum extensively covers parallel and distributed database systems, database transactions, and recent developments in database technologies, providing knowledge of both structured and unstructured databases like MongoDB, SQL, and XML, while emphasizing the importance of database architecture, data mining, and techniques for managing large datasets in today's information-driven business world.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Manage both structured and unstructured data using various tools for Database.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Apply the concept of concurrency control.
- CO2 - Analyse various database architectures
- CO3 - Use Object Oriented and XML queries on Database.
- CO4 - Manipulate data using NoSQL commands.
- CO5 - Use data mining and warehousing concepts.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
315324	ADVANCE DATABASE MANAGEMENT	ADM	DSE	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 10 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Use the given locking protocols for concurrency control. TLO 1.2 Describe the architecture and functionality of various database models. TLO 1.3 Differentiate between Transaction Server and Data Server.	**Unit - I Database System Architecture** 1.1 Concurrency Control Techniques: Concurrency control protocols: Locked Based protocols, granting of locks, Two Phase Locking protocol 1.2 Database Model: Centralized Database System, Server System Architecture, Transaction Server, Data Server	Video Demonstrations Presentations Lecture Using Chalk-Board
2	TLO 2.1 Explain the functioning of parallel database system. TLO 2.2 Explain the architecture of distributed database system. TLO 2.3 Differentiate between Parallel and Distributed Database.	**Unit - II Parallel & Distributed Database System.** 2.1 Introduction to parallel Systems: Parallel database system architecture, Measure of Performance-Throughput, Response time, scaleup and speed up 2.2 Introduction to distributed database, Types of Distributed Database Systems, Benefits of distributed database system, Advantages and Disadvantages of Distributed Database 2.3 Transaction Processing in Parallel and Distributed Database Systems	Lecture Using Chalk-Board Presentations Video Demonstrations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Explain the characteristics of object-based database. TLO 3.2 Write the given SQL queries using Table Inheritance. TLO 3.3 Write the given SQL queries using Array and Multiset. TLO 3.4 Write SQL queries to refer the given object using object identity. TLO 3.5 Write XML queries on given data.	**Unit - III Object Based Database & XML** 3.1 Object Based Database: Overview, Complex data types, Structured types and inheritance in SQL 3.2 Table inheritance 3.3 Array and multiset types in SQL 3.4 Object-oriented vs. Object-Relational database 3.5 XML: Introduction, Structure of Xml Data, Xml Document Schema, Xpath, XQuery: FLWOR Expressions, Joins, Nested Queries, Sorting of Functions, Functions and Types	Lecture Using Chalk-Board Presentations Video Demonstrations
4	TLO 4.1 Differentiate between structured and Unstructured Data. TLO 4.2 Write NoSQL query to solve given problem. TLO 4.3 Differentiate SQL and NoSQL database. TLO 4.4 Write query to execute find() function on given data. TLO 4.5 Explain basic operations performed on MongoDB shell on given data.	**Unit - IV NoSQL & MongoDB** 4.1 Structured versus Unstructured Data 4.2 NoSQL database concepts: Types of NoSQL database, NoSQL data modeling, Benefits of NoSQL, comparison between SQL and NoSQL database system 4.3 NoSQL using MongoDB: Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types ,Arrays, Embedded Documents 4.4 Querying with MongoDB: find() function, specifying which keys to return, query criteria, OR queries, Types specific querying	Lecture Using Chalk-Board Presentations Hands-on
5	TLO 5.1 Describe the given data warehouse architecture. TLO 5.2 Explain the Functions of Data warehouse Tools. TLO 5.3 Perform redundancy and correlation analysis for the given database. TLO 5.4 Analyze given data using data mining to extract useful pattern. TLO 5.5 Understand Data Lakehouse for data management.	**Unit - V Data Mining & Warehousing** 5.1 Data warehousing: Components of a Data Warehouse, virtual warehouse 5.2 Functions of Data warehouse Tools: Extraction, Transformation and loading 5.3 Data Mining: Classification, Decision-Tree Classifiers, Regression, Validating a Classifier 5.4 Association Rules, Clustering, Other Forms of Data Mining 5.5 Introduction to Data Lake House	Lecture Using Chalk-Board Video Demonstrations Presentations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Understanding Server System Architecture in Databases	1	1. Install suitable Database. 2 .Configure a server-based database and establish client-server connections.	2	CO1
LLO 2.1 Implement Locked Based protocols.	2	*Execute query to implement Locked Based protocols.	2	CO1
LLO 3.1 Understand Parallel and Distributed Systems through Case Study	3	Study Parallel and Distributed system using Case.	2	CO2
LLO 4.1 Create database using XML Attributes and Elements.	4	Create database using XML 1. Create a xml file for given Application 2. Create database using xml file 3. Confirm database path 4.Show database	2	CO3
LLO 5.1 Implement queries based on FLWOR expressions using XQuery. LLO 5.2 Implement joins queries using XQuery. LLO 5.3 Implement nested queries using XQuery.	5	*4.1 Implement queries based on FLWOR expressions 1. Create a xml file 2. Confirm the path expression 3. Use FLWOR expression for given criteria to display result from xml file 4. Execute Join queries *4.2 Implement queries based on nested queries and sorting of results using XQuery 1. Create a xml file 2. Execute queries based on Nested queries and sorting of results using XQuery	2	CO3
LLO 6.1 Execute queries using type inheritance and table inheritance in SQL.	6	*Execute query using type inheritance and table inheritance 1. Create Parent Table and child table for given application 2. Execute queries using inheritance approach by combining a data from parent, child tables	2	CO4
LLO 7.1 Implement queries using Array and Multiset types in SQL.	7	*Execute query using Array and Multiset types in SQL 1. Create an array Type and Multiset type 2. Use array type and Multiset type as a column name in table 3. Insert and display the data from table	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Develop MongoDB Queries using basic operations.	8	*Execute MongoDB Query using basic operations 1. Create a database for given application 2. Use DATABASE statement 3. Insert, update and delete the record for given application	2	CO4
LLO 9.1 Implement aggregation Queries using MongoDB. LLO 9.2 Implement MongoDB Queries Using find () function.	9	*9.1 : Implement aggregation queries 1. Write MongoDB queries using aggregate function for given application *9.2: Execute query using find() function 1. Write MongoDB queries using find () for given application	2	CO4
LLO 10.1 Use extract, transform, and load (ETL) data warehousing tool.	10	*Use Data warehousing tool (ETL) 1. Extract the relevant data from the source database 2. Transform the data so that it is better suited for analytics 3. Load the data into the target database	2	CO5
LLO 11.1 Understand the concept of classification in data mining	11	Implement Classification Techniques in Data Mining	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Develop and maintain XML database for Employee Attendance System
- Develop a MongoDB database for tracking patient history in a healthcare system.
- Develop a MongoDB database for tracking issued and pending books in a library.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Any DBMS software (MySQL/Oracle/SQL server/MongoDB or any suitable database software)	All
2	Computer system (Any computer system with basic configuration)	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Database System Architecture	CO1	6	4	4	2	10
2	II	Parallel & Distributed Database System.	CO2	8	4	4	4	12
3	III	Object Based Database & XML	CO3	10	2	6	10	18
4	IV	NoSQL & MongoDB	CO4	10	4	4	10	18
5	V	Data Mining & Warehousing	CO5	6	4	4	4	12
Grand Total				**40**	**18**	**22**	**30**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators.
- Each practical will be assessed considering 60% weightage to process, 40% weightage to product.
- A continuous assessment based term work

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	1	1	1	1	-	2			
CO2	2	2	2	1	1	-	2			
CO3	2	2	2	2	-	-	2			
CO4	2	2	2	2	-	-	2			
CO5	2	2	1	1	1	-	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number

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Sr.No	Author	Title	Publisher with ISBN Number
1	Korth Henery	Database System Concepts	McGraw Hill Education, New Delhi, 6th Edition ,ISBN -13:978-93-329-0138-4
2	Chakrabarti, Dasgupta, Shinde, KLSI	Advanced Database Management System	Dreamtech Press ,ISBN 13 :9789351194552
3	Bayross Ivan	SQL, PL/SQL The Programming Language of ORACLE	BPB Publications, New Delhi, 3rd Edition ISBN-13: 978-8176569644
4	Jiawei Han,Micheline Kamber,Jian Pei	Data Mining Concepts and Techniques	Morgan Kaufmann ,USA,3rd Edition, ISBN-978-0-12-381479-1

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://docs.mongodb.com/manual/tutorial/install-mongodb-on-windows/	MangoDB installation
2	www.learn-with-video-tutorials.com/data-warehouse-tutorial-video	Advanced database management system concept
3	https://www.javatpoint.com/xml-database	XML Tutorial
4	https://www.javatpoint.com/data-warehouse	Data Warehouse and Data Mining
5	https://www.youtube.com/watch?v=L54ajG7vtZA&list=PLPphbOQYOrDrTLR_4BBxYpaJAtluFEkS9	ADVANCED DATABASE CONCEPTS-(DATABASE SYSTEM ARCHITECTURES)

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students