II- Year II- Semester	Name of the Course	L	T	P	C
PC2202	Database Management System	3	0	0	3

Course Objectives:

1. Study the basic concepts and importance of Database Management Systems
2. Learn and understand the conceptual design of database and information retrieval
3. Learn various commands and writing of queries for information retrieval
4. Understand the concepts of Database design
5. Study of internal storage and its access

Unit-I: Introduction (10hrs)

Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture

Unit-II: Conceptual Design & Relational Query Languages (10 hrs)

Conceptual Design of Database using ER Model, Notations, Types of attributes, Relation, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design

Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples

Relational Calculus: Tuple Relational Calculus and Domain Relational Calculus, Safety Expressions

Unit-III: SQL & PL/SQL (10 hrs)

SQL Commands: DDL, DML, TCL, DCL

Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers…)

Unit-IV: Database Design (8 hrs)

Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF

Why NoSQL? Importance of NoSQL

Unit-V: Transaction, Data Recovery & Storage Management (10 hrs)

Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols, Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait

Recovery Management: Types of failures, ideal storage, Log, Log records, log based recovery techniques, Shadow Paging, ARIES

File Organization & Indexing: Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing

Text Books:

1. Data base System Concepts,5/e, Silberschatz, Korth, TMH

2. Introduction to Database Systems, CJ Date, Pearson

Reference Books:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, and TATA McGraw Hill 3rd Edition
2. Fundamentals of Database Systems, ElmasriNavate Pearson Education

Course Outcomes:

By the end the of the course, the student will be able to

CO1: To **understand** the basics of database systems and applications

CO2: To **construct** logical design of database and information retrieval

CO3: To **demonstrate** relational model practically (Structured Query Language)

CO4: To **demonstrate** and relate normalization for database design

CO5: To **outline** the necessity of transaction management, recovery management, file organization & indexing

CO-PO Mapping Matrix:

Mapping	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
C01	2	--	--	--	--	--	3	--	--	--	--	--	1	--
C02	3	2	2	--	--	--	--	--	--	--	--	--	--	2
C03	3	2	1	--	3	--	--	--	--	--	--	--	2	3
C04	3	2	1	--	--	--	--	--	--	--	--	--	1	3
C05	2	--	--	--	--	--	--	--	--	--	--	--	1	--

Micro Syllabus of Database Management Systems

UNIT - I : INTRODUCTION

Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture

Unit	Module	Micro Content
UNIT I	Introduction to Database	Definitions of data, database and information
		History of data
		Importance of databases over file systems
		Applications of Database
		Purpose of Database
		View of Data

		Data Independence
		Data Models
		Users of Database
		DBA
		Query Processor
		Storage Manager
		Database Architecture

UNIT – II: Conceptual Design & Relational Query Languages

Conceptual Design of Database using ER Model, Notations, Types of attributes, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design

Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples

Relational Calculus: Tuple Relational Calculus and Domain Relational Calculus, Safety Expressions

Unit	Module	Micro Content
UNIT II	Conceptual Design	ER Model
		Notations
		Types of attributes
		Mapping Constraints
		Features of ER Diagram
		Weak Entity Set
		Examples of Conceptual Design
	Relational Algebra	Selection
		Projection
		Set Operations
		Rename
		Cartesian-Product
		Join
		Outer Join
		Safety Expressions
	Relational Calculus	Tuple Relational Calculus
		Domain Relational Calculus
		Safety Expressions

UNIT – III: SQL & PL/SQL

SQL Commands: DDL, DML, TCL, DCL

Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers)

Unit	Module	Micro Content
UNIT III	SQL Commands	DDL
		DML
		TCL
		DCL
	Types of Constraints	Primary
		Alternate
		Not Null
		Check
		Foreign
	SQL Queries	Basic

		Joins
		Set operations
		Group operations
		Various types of queries
	PL/ SQL	Cursor
		Procedures
		Functions
		Packages
		Triggers

UNIT – IV: Database Design

Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF. Why NoSQL?, Importance of NoSQL

Unit	Module	Micro Content
UNIT IV	Database Design	Normalization
		Purpose of Normalization
		Functional Dependency
		Closure
		1NF
		2NF
		3NF
		BCNF
		MVFD
		4NF
		Join Dependency
		5NF
	NoSQL	Why NoSQL?
		Importance of NoSQL
		Overview of NoSQL tools

UNIT - V: Transaction, Data Recovery & Storage Management

Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols (2PLP, Tree & Multiple Granularity), Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait

Recovery Management: Types of failures, ideal storage, Log, Log records, log based recovery techniques, Shadow Paging, ARIES

File Organization & Indexing: Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing.

Unit	Module	Micro Content
UNIT V	Transaction Management	ACID Properties of Transactions
		Conflict & View serializability
		Lock based protocols (2PLP, Tree & Multiple Granularity)
		Time Stamp based protocol, Thomas Write Rule
		Validation Based Protocol
		Deadlock detection
		Deadlock avoidance
		Deadlock prevention: wait-die and wound-wait
	Recovery Management	Types of failures
		Ideal storage

		Log, Log records, log based recovery techniques
		Shadow Paging
		ARIES
	File Organization & Indexing	Types of File Organizations
		Primary Indexing
		Secondary Indexing
		Hash Indexing: Static and Dynamic
		Tree Indexing

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