

### Database Management Systems Micro Syllabus

<b>Offering Branch:</b>	CSE		
<b>Course Category:</b>	Program Core	<b>Credits:</b>	3
<b>Course Type:</b>	Theory	<b>Lecture-Tutorial- Practical:</b>	3-0-0
<b>Prerequisites:</b>	Engineering	<b>Continuous Evaluation:</b>	30
	Mathematics-1, Data	<b>Semester End Evaluation:</b>	70
	Structures	<b>Total Marks:</b>	100
<b>Course Outcomes</b>			
Upon successful completion of the course, the student will be able to:			
<b>CO1</b>	Understand the basic concepts of database management systems		<b>L2</b>
<b>CO2</b>	Apply SQL or Relational Algebra operations to find solutions for a given application		<b>L3</b>
<b>CO3</b>	Apply normalization techniques to improve database design		<b>L3</b>
<b>CO4</b>	Analyze a real time scenario to use Conceptual and Relational data models for designing the database		<b>L4</b>
<b>Course Content</b>			
<b>UNIT-1</b>	<b>Introduction to Databases:</b> Introduction, An Example, <b>Characteristics of the Database Approach</b> - Self-Describing Nature of Database System, Insulation between Programs, Data and Data Abstraction, Support of Multiple Views of the Data, Sharing of Data and Multiuser Transaction Processing		<b>CO1</b>
	<b>Advantages of Using the DBMS Approach</b> - Controlling Redundancy, Restricting Unauthorized Access, Providing Persistent Storage for Program Objects, Providing Storage Structures and Search Techniques for Efficient Query Processing, Providing Backup and Recovery, Providing Multiple User Interfaces, Representing Complex Relationships among Data, Enforcing Integrity Constraints, Permitting Inferencing and Actions Using Rules, Additional Implications of Using the Database Approach, <b>A Brief History of Database Applications</b> - Early Database Applications Using Hierarchical and Network Systems, Providing Data Abstraction and Application Flexibility with Relational Databases, Object-Oriented Applications and the Need for More Complex Databases, Interchanging Data on the Web for E-Commerce Using XML, Extending Database Capabilities for New Applications, Databases versus Information Retrieval <b>Data Models, Schemas, and Instances</b> - Categories of Data Models, Schemas, Instances, and Database State		

	<p><b>Three-Schema Architecture and Data Independence</b> - The Three-Schema Architecture, Data Independence, <b>Database Languages and Interfaces</b> - DBMS Languages, DBMS Interfaces</p> <p><b>The Database System Environment</b> - DBMS Component Modules, Database System Utilities, Tools, Application Environments and Communications Facilities</p> <p><b>Centralized and Client/Server Architectures for DBMSs</b> - Centralized DBMSs Architecture, Basic Client/Server Architectures, Two-Tier Client/Server Architectures for DBMSs, Three-Tier and n-Tier Architectures for Web Applications</p>	
UNIT-2	<p><b>Conceptual Data Modeling:</b>  <b>High-Level Conceptual Data Models for Database Design, A Sample Database Application,</b>  <b>Entity Types, Entity Sets, Attributes and Keys-</b> Entities and Attributes, Entity Types, Entity Sets, Keys, and Value Sets, Initial Conceptual Design of the COMPANY Database.  <b>Relationship Types, Relationship Sets, Roles, and Structural Constraints</b> - Relational Types, Sets, and Instances, Relationship Degree, Role Names, and Recursive Relationships, Constraints on Binary Relationship Types, Attributes of Relationship Types.  <b>Weak Entity Types, Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions and Design Issues</b> - Summary of Notation for ER Diagram, Proper Naming of Schema Constructs, Design Choices for ER Conceptual Design, Alternative Notation for ER Diagrams.  <b>Relationship Types of Degree Higher Than Two</b> - Choosing between Binary and Ternary (or Higher Degree) Relationships, Constraints on Ternary (or Higher Degree) Relationships.  <b>Relational Database Design Using ER-to-Relational Mapping-</b> ER-to-Relational Mapping Algorithm.</p>	CO1,CO4
UNIT-3	<p><b>Relational Model:</b>  <b>Relational Model Concepts</b> - Domains, Attributes, Tuples, and Relations, Characteristics of Relations, Relational Model Notation.  <b>Relational Model Constraints and Relational Database Schemas</b> - Domain Constraints, Key Constraints and Constraints on NULL Values, Relational Databases and Relational Database Schemas, Entity Integrity, Referential Integrity, and Foreign Keys, Other Types of Constraints  <b>Basic SQL:</b>  <b>SQL Data Definition and Data Types</b> - Schema and Catalog Concepts in SQL, The CREATE TABLE Command in SQL, Attribute Data Types and Domains in SQL, <b>Specifying Constraints in SQL-</b> Specifying</p>	CO1, CO2,CO4

	<p>Attribute Constraints and Attribute Defaults, Specifying Key and Referential Integrity Constraints, Giving Names to Constraints, Specifying Constraints on Tuples Using CHECK</p> <p><b>Basic Retrieval Queries in SQL-</b> The SELECT-FROM-WHERE Structure of Basic SQL Queries, Ambiguous Attribute Names, Aliasing, Renaming, and Tuple Variables, Unspecified WHERE Clause and Use of the Asterisk, Tables as Sets in SQL, Substring Pattern Matching and Arithmetic Operators, Ordering of Query Results.</p> <p><b>INSERT, DELETE, and UPDATE Statements in SQL</b> - The INSERT Command, The DELETE Command, The UPDATE Command</p> <p><b>More SQL: Complex Queries, Triggers, Views - More Complex SQL Retrieval Queries</b> - Comparisons Involving NULL and Three-Valued Logic, Nested Queries, Tuples, and Set/Multiset Comparisons, Correlated Nested Queries, The EXISTS and UNIQUE Functions in SQL, Explicit Sets and Renaming of Attributes in SQL, Joined Tables in SQL and Outer Joins, Aggregate Functions in SQL, Grouping : The GROUP BY and HAVING Clauses, Discussion and Summary of SQL Queries,</p> <p><b>Specifying Constraints as Assertions and Actions as Triggers-</b> Specifying General Constraints as Assertions in SQL, Introduction to Triggers in SQL,</p> <p><b>Views (Virtual Tables) in SQL-</b>Concept of a View in SQL, Specification of Views in SQL, View Implementation, View Update, and Inline Views.</p> <p><b>Relational Algebra- Unary Relational Operations: SELECT and PROJECT</b> - The SELECT Operation, The PROJECT Operation, Sequences of Operations and the RENAME Operation.</p> <p><b>Relational Algebra Operations from Set Theory-</b>The UNION, INTERSECTION, and MINUS Operations, The CARTESIAN PRODUCT (CROSS PRODUCT) Operation, <b>Binary Relational Operations: JOIN and DIVISION</b>, The JOIN Operation, Variations of JOIN: The EQUIJOIN and NATURAL JOIN, A Complete Set of Relational Algebra Operations, The DIVISION Operation.</p> <p><b>Examples of Queries in Relational Algebra.</b></p>	
UNIT-4	<p><b>Database Design Theory and Normalization: Functional Dependencies-</b> Definition of Functional Dependency.</p> <p><b>Normal Forms Based on Primary Keys-</b> Normalization of Relations, Practical Use of Normal Forms, Definitions of Keys and Attributes Participating in Keys, First Normal Form, Second Normal Form, Third Normal Form.</p> <p><b>Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form</b> - Formal</p>	CO1, CO3,CO4

	Definition of Multi valued Dependency. <b>Join Dependencies and Fifth Normal Form.</b>	
UNIT-5	<b>Transaction Processing:</b> <b>Introduction to Transaction Processing-</b> Single-User versus Multiuser Systems, Transactions, Database Items, Read and Write Operations, and DBMS Buffers, Why Concurrency Control Is Needed, Why Recovery Is Needed, <b>Transaction and System Concepts-</b> Transaction States and Additional Operations, The System Log, Commit Point of a Transaction. <b>Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability-</b> Schedules (Histories) of Transactions, Characterizing Schedules based on Recoverability. <b>Characterizing Schedules Based on Serializability -</b> Serial, Nonserial, and Conflict-Serializable Schedules, Testing for Serializability of a Schedule, How Serializability is Used for Concurrency Control, View Equivalence and View Serializability, <b>Transaction Support in SQL</b> <b>Introduction to Concurrency Control:</b> <b>Two-Phase Locking Techniques-</b> Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking. <b>Introduction to Recovery Protocols:</b> <b>Recovery Concepts -</b> Recovery Outline and Categorization of Recovery Algorithms, Caching (Buffering) of Disk Blocks, Write-Ahead Logging, Steal/No-Steal, and Force/No-Force, Checkpoints in the System Log and Fuzzy Check pointing, Transaction Rollback and Cascading Rollback. <b>NO-UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.</b>	CO1
<b>Learning Resources</b>		
Text book:		
1.	Fundamentals of Database Systems, Ramez Elmasri,Shamkant B. Navathe, Seventh edition, Pearson.	
References :		
1.	Data base System Concepts, Abraham Silberschatz, Henry F Korth, S. Sudarshan, Fifth Edition, McGraw Hill	
2.	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, Third Edition,TMH.	
3.	Introduction to Database Systems, C.J.Date, Eighth Edition , Pearson	
e-Resources and other Digital Material:		
	1. <a href="https://nptel.ac.in/courses/106/105/106105175/">https://nptel.ac.in/courses/106/105/106105175/</a> 2. <a href="https://onlinecourses.nptel.ac.in/noc21cs04/">https://onlinecourses.nptel.ac.in/noc21cs04/</a> 3. <a href="https://nptel.ac.in/courses/106/106/106106093/">https://nptel.ac.in/courses/106/106/106106093/</a>	