

**DEPARTMENT OF COMPUTER SCIENCE**

**Gopinath Bordoloi Nagar, Gauhati University**

**Guwahati-781014, Assam, India**

LESSON PLAN

**Subject Name :** Advanced Database Management System

**Paper Code :** CSC1056/INF1056 **Session:** 2022-2023

**Program Name :** M.Sc. (CS/IT) **Semester:** Second

**Faculty Name :** Dwipen Laskar  
**Date :** 01/08/2022 to 12/12/2022

**Detailed Lesson Plan**

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|  | **UNIT-I (Relational Model)** |
| **Lecture**  **No** | **Topics to be Covered** |
| 1 | Introduction to DBMS, File Processing System, Advantages and Disadvantages of DBMS |
| 2 | Relational model concepts, Data Models in DBMS, Relational databases, schemas, Instances |
| 3 | Three-tier architecture of a DBMS, Data Independence (Physical and Logical) |
| 4 | Basic concepts of Relational Data Model, Types of Constraints in Relational Model, |
| 5 | Various types of Keys in DBMS, Relational algebra operations (SELECT, PROJECT) |
| 6 | Relational algebra operations (RENAME, UNION, INTERECTION, DIFFERENCE,CARTESIAN PRODUCT) |
| 7 | JOIN operations-INNER JOIN (THETA, NATURAL, EQUI) |
| 8 | JOIN operations-OUTER JOIN (LEFT, RIGHT, FULL,DIVISON) |
| 9 | Extended Relational Operators (Extended Projections, Aggregate Functions) |
| 10 | Relational Calculus (Tuple Relational Calculus, Domain Relational Calculus) |
| 11 | Database Languages(DDL, DML, TCL, DCL), SQL statements (CREATE, DROP) |
| 12 | SQL statements (ALTER, DELETE, SELECT, WHERE, LIKE, BETWEEN, IN) |
|  | **UNIT-II (Semantic Modelling)** |
| 13 | Introduction to E-R model, Query Tree, Modeling using ER diagram |
| 14 | Primitives of E-R diagrams, Relationship in ER diagram, Types of Relationships (Unary, Binary, Ternary, Recursive, N-ary), |
|  | Types of Entities (Strong and Weak), Types of Attributes |
| 15 | Constraints on Binary Relationships: Cardinality ratio, Mapping Cardinalities (One to One, One to Many, Many to One, Many to Many) |
| 16 | Participation Constraints (Total and Partial), Design of database with E-R model |
| 17 | Transformation of ER model to relational schema (Strong Entity, Weak Entity, Composite and Multi-valued Attribute) |
| 18 | Transformation of ER model to relational schema (One to One relationship, Many to One, One to many and Many to Many Relationship) |
| 19 | Enhanced ER diagram, Generalization, Specialization, Constraints on Specialization and Generalization, Membership Constraints, User Defined, attribute-defined |
| 20 | Completeness Constraint, Hierarchy and lattice, Union or Category, Aggregation, |
| 21 | Mapping specialization/generalization to relational tables, Relational Database Design by ER-to-Relational Mapping, Transformation of EER model to relational schema |
|  | **UNIT-III (Normalization and Functional Dependency)** |
| 20 | Concept of Functional Dependency, Types of Functional Dependency, |
| 21 | Armstrong’s Axioms of Functional Dependency, Dependency-preserving property |
| 22 | Lossless join property, Equivalence of sets of functional dependencies |
| 23 | Algorithms to ensure dependency -preserving property and lossless join property |
| 24 | Finding out Candidate keys from a given FD set, Cover of Functional Dependency, Equivalent set of Functional Dependency Sets with Examples, |
| 25 | Canonical Cover of a Functional Dependency Set, Algorithm of minimal cover, Closure of Functional Dependency, Cover of FD |
| 27 | Definition of Normalization, Concept of Insertion, Deletion, Updation anomalies |
| 28 | Definition and Concept of 1NF, 2NF, Conversion of a relational into 1NF and 2NF |
| 29 | Definition and Concept of 3NF, BCNF, Conversion of a relational into 3NF and BCNF |
| 30 | Definition and Concept of 4NF, 5NF, Conversion of a relational into 4NF and 5NF |
|  | **UNIT-IV (System implementation techniques)** |
| 31 | Query processing and optimization- translation between SQL queries and relational algebra |
| 32 | Transaction processing- transaction and system concepts, desirable properties, Transaction States, Concurrent Transactions , |
| 33 | Serializable Schedules (Serializability: Serial, Nonserial, and conflict Serialiable), |
| 34 | Locking Techniques: Types of Locks, Two Phase Locking (2PL), Guaranteeing Serializability by Two Phase Locking, Timestamp based protocols |
| 35 | Database Recovery- concepts and techniques, recovery in multi-database systems Kinds of failures, Failure controlling methods (Log base recovery, shadow copy scheme, heckpoints, |
| 36 | Concurrency control- locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques |
| 37 | Database recovery concepts, Log Based Recovery, Shadow Paging , Security and authentication- issues |
| 38 | Access control techniques: Types of Discretionary Privileges, Mandatory Access Control for Multilevel Security |
|  | **UNIT-V (Object Oriented Database System)** |
| 39 | Concepts of object-oriented databases; Standards, languages(Object Data Management Group (ODMG)), Advantages and Disadvantages of OODBMS |
| 40 | Limitation of Relational Databases, The Need for Object Oriented Databases, Object Oriented Data Model |
| 41 | Need of Complex Data Types, Object Structure, Message and Methods, Object and Classes |
| 42 | Inheritance, Polymorphism, Inheritance, Encapsulation, Abstraction, Associations |
| 43 | ODMG Object Definition Language, Mapping Object-Oriented Conceptual Models to ODL |
|  | **UNIT-VI (Distributed Database System)** |
| 44 | Introduction of Distributed Databases, Distributed System Architecture, Design Issues, Data Fragmentation, Data fragmentation, replication, and allocation techniques |
| 45 | Features of Distributed Databases-Distributed databases versus Centralized Databases |
| 46 | Types of distributed database systems, Principles—Levels Of Distribution- Transparency-Reference Architecture- Types of Data Fragmentation |
| 47 | Integrity Constraints in Distributed Databases- Architectural Issues- Alternative Client/Server Architecture |
| 48 | Query processing in distributed databases, Overview of concurrency control and recovery in distributed databases. |
| 49 | Distributed Query Processing: Query Transformation, Simple JOIN processing, |
| 50 | Distributed Transaction Processing, Transaction System Structure, Types of transactions (Local and Global Transactions), System Failure Models, |
| 51 | Distributed Concurrency Control, Approaches: Single lock Manager Approach 2), Distributed lock Manager Approach |
| 52 | Deadlock Handling in Distributed Database System |
|  | **UNIT-VII (Image, multimedia, and spatial databases)** |
| 53 | Concepts of Image, multimedia, and spatial databases |
| 54 | Content-based indexing and retrieval |
| 55 | Indexing techniques- R trees, Properties of R-tree, Applications of R-Tree |
| 56 | Indexing techniques-R+ trees, KD trees. |

(**Dwipen Laskar**)

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