GITA\_cse\_Syllabus.pdf

• Fundamentals of Database Systems  
 o ER Diagram  
 o Internal Storage Structures  
 o Transaction Processing Techniques  
• Introduction to Database Systems  
 o Relational Data Model  
 o SQL  
 o Aggregation Functions  
 o Embedded SQL  
• Database Management Systems Lab  
 o SQL Syntax: Insertion, Deletion, Join, Updation  
 o Join Statements and SQL Queries  
 o Procedures and Functions  
 o Database Triggers  
 o Packages  
 o Data Recovery using Check Point Technique  
 o Concurrency Control using Lock Operations  
 o ODBC using VB or VC++  
 o JDBC  
 o Embedded SQL using C/C++  
• Database Management Systems  
 o Data Models  
 o ER Diagram  
 o Internal Storage Structures  
 o Transaction Processing Techniques  
 o Relational Data Model  
  Concept of Relations  
  Schema-Instance Distinction  
  Keys  
  Referential Integrity and Foreign Keys  
  Relational Algebra Operators  
  SQL  
 • Data Definition in SQL  
 • Table, Key, and Foreign Key Definitions  
 • Update Behaviors  
 • Querying in SQL  
 • Aggregation Functions  
 • Group By and Having Clauses  
 • Embedded SQL  
 o Database Design  
  Dependencies and Normal Forms  
  Dependency Theory  
 • Functional Dependencies  
 • Armstrong's Axioms for FD's  
 • Closure of a Set of FD's  
 • Minimal Covers  
  Normalization  
 • 1NF, 2NF, 3NF, BCNF  
 • Decompositions  
 • Algorithms for 3NF and BCNF Normalization  
 • 4NF and 5NF  
 o Transactions  
  Transaction Processing  
  ACID Properties  
  Concurrency Control  
 • Locking Based Protocols  
  Error Recovery and Logging  
 • Undo, Redo, Undo-Redo Logging and Recovery Methods  
 o Implementation Techniques  
  Data Storage and Indexes  
 • File Organizations  
 • Primary and Secondary Index Structures  
 • Hash-Based Index Structures  
 • Dynamic Hashing Techniques  
 • Multi-Level Indexes  
 • B+ Trees

BMS\_MCA\_2023 \_Scheme\_and\_Syllabus.pdf

• Database Management Systems  
 o Introduction to DBMS  
 o Characteristics of Database Approach  
 o Actors on the Scene  
 o Workers behind the Scene  
 o Advantages of using DBMS Approach  
 o Data Models, Schemas, and Instances  
 o Three-Schema Architecture and Data Independence  
 o Entity-Relationship Model  
  Entity Types  
  Entity Sets  
  Attributes and Keys  
  Relationship Types  
  Relationship Sets  
  Roles and Structural Constraints  
  Weak Entity Types  
 o Relational Model  
  Relational vs Non-Relational DBMS  
  Relational Model Concepts  
  Relational Model Constraints  
  Relational Database Schema  
  Update Operations  
  Transactions and Constraint Violations  
  Unary Relational Operations  
  Relational Algebra Operations from Set Theory  
  Binary Relational Operations  
  JOIN and DIVISION  
  Additional Relational Operations  
  Queries in Relational Algebra  
  ER-to-Relational Mapping  
 o Introduction to SQL  
  SQL Query Language  
  SQL Data Definition  
  Basic Structure of SQL Queries  
  Additional Basic Operations  
  Null Values  
  Aggregate Functions  
  Modification of the Database  
  Join Expressions  
  Views  
  Transactions  
  Integrity Constraints  
  SQL Data Types and Schemas  
  Authorization  
  Database Programming Issues and Techniques  
  Embedded SQL  
 o Database Design  
  Informal Design Guidelines for Relation Schemas  
  Functional Dependencies  
  Normal Forms based on Primary Keys  
  2nd and 3rd Normal Forms  
  Boyce Codd Normal Forms  
  Stored Procedures and Functions  
  Triggers  
  Views  
 o Transaction Management  
  Transaction Concept  
  Simple Transaction Model  
  Desirable Properties of Transaction  
  Concurrency Control: Lock Based Protocols  
  Recovery Techniques  
  Recovery Concepts  
  Recovery in Multi-Database Systems  
  Database Backup and Recovery from Catastrophic Failures  
 o Laboratory  
  Create a Database including Primary Key and Foreign Key Concepts  
  Aggregate Functions  
  Group by / Having Clause  
  Stored Procedures / Functions  
  Triggers  
  Views  
  Build a Database for any Given Application  
  
• Advanced Database Management Systems  
 o DBMS Basics  
  DBMS Architecture  
  Data Abstraction  
  Physical DBMS Architecture  
  Data Models  
  Relational Database Design  
  Generalization Hierarchy  
  Extended ER Features  
  Functional Dependency Theory and Normalization  
  Multi-Valued Dependency  
  Join Dependency and 5NF  
 o Database Design and Implementation  
  Query Languages  
  Advanced SQL and PL/SQL  
  Views and Assertion  
  Materialized Views  
  Summary Management and its Components  
  Functions and Procedures  
  Packages  
  Synonyms  
  Sequences  
 o DBMS Advanced Features and Distributed Database  
  Database System Catalogs  
  Query Compiler  
  Query Processing and Evaluation  
  Transaction Management and Recovery  
  Database Security and Authorization  
  Distributed Database  
 o Enhanced Database Models  
  Object-Oriented Database  
  Limitations of Relational Database  
  Need for Complex Data Type  
  Collection Types and Structured Types  
  Data Definition  
  Persistent Programming Languages  
  Object-Oriented vs Object-Relational Databases  
  Database and XML  
  Structured, Semi-Structured, and Unstructured Data  
  XML Hierarchical Model  
  DTD and XML Schema  
 o Emerging Database Models, Technologies and Applications  
  Multimedia Database  
  Differentiation from Other Types of Data  
  Structure of Multimedia Database  
  Deductive Databases  
  GIS and Spatial Database  
  Knowledge Database  
  Information Visualization  
  Graphical Representation  
  Gnome Database

BMS\_Syllabus.pdf

• Database Management Systems  
 o Introduction to Databases  
  Introduction  
  An Example  
  Characteristics of Database approach  
  Advantages of using DBMS approach  
  When not to use a DBMS  
 o Database System Concepts and Architecture  
  Data models  
  Schemas and instances  
  Three schema architecture  
 o SQL  
  SQL Data Definition and Data Types  
  Specifying basic constraints in SQL  
  Schema Change Statement in SQL  
  Basic retrieval queries in SQL  
  Insert, Delete and Update statements in SQL  
  Additional features of SQL  
  More complex SQL Queries  
  Views (Virtual Tables) in SQL  
  Triggers and Stored Procedures  
• Data Modelling  
 o Entity-Relationship (ER) model  
  Using High-Level conceptual Data Models for Database Design  
  A sample Database Application  
  Entity types, Entity Sets, Attributes and Keys  
  Relationship Types, Relationship Sets, Roles and Structural Constraints  
  Weak Entity types  
  Refining the ER Design  
  ER Diagrams  
  Relationship Types of Degree Higher than two  
  Relational Database Design using ER-to-Relational Mapping  
 o Relational Algebra  
  Unary Relational Operations  
  SELECT and PROJECT  
  Relational Algebra Operations from Set Theory  
  Binary Relational Operations: JOIN and DIVISION  
  Aggregate functions and Grouping  
• Database Design Theory and Normalization  
 o Informal Design Guidelines for Relation Schemas  
 o Functional Dependencies  
 o Normal Forms Based on Primary Keys  
 o General Definitions of Second and Third Normal Forms  
 o Boyce-Codd Normal Form  
 o Multi-valued Dependencies and a Fourth Normal Form  
 o Join Dependencies  
 o Fifth Normal Form  
• Transaction Processing and Concurrency Control  
 o Introduction to Transaction Processing  
 o Transaction and System Concepts  
 o Desirable Properties of Transactions  
 o Characterizing Schedules Based on Recoverability  
 o Characterizing Schedules Based on Serializability  
 o Two-Phase Locking Techniques for Concurrency Control  
 o ARIES Recovery Algorithm  
• NoSQL  
 o Overview of NoSQL  
 o Characteristics of NoSQL  
 o NoSQL storage types  
 o Advantages and Drawbacks of NoSQL  
 o Case Study: Application definition, Requirement Analysis, Implementation using MongoDB, Database Queries, Writing Queries  
• Vector Database  
 o Introduction  
 o Vector Index  
 o Working of Vector database

IIITB\_Course\_Catalog.pdf

• Introduction to Databases  
 o Database and database users  
 o Database system concepts and architectures  
• Conceptual Data Modeling and Database Design  
 o Entity-relationship (ER) model  
 o UML class diagrams  
• Relational Databases  
 o Relational data model  
 o Relational database constraints  
 o Basic SQL  
 o Queries  
 o Triggers  
 o Views  
 o Schema modification  
• Database Design Theory and Normalization  
 o Functional dependencies  
 o Normalization for relational databases  
 o Relational database design algorithms  
• File Structures, Hashing, Indexing, and Physical Database Design  
 o Disk storage  
 o Basic file structures  
 o Hashing  
 o Modern storage architectures  
 o Indexing structure for files  
 o Physical database design  
• Query Processing and Optimization  
 o Strategies for query processing  
 o Query optimization  
• Transaction Processing, Concurrency Control, and Recovery  
 o Introduction to transaction processing  
 o Concurrency control techniques  
 o Database recovery techniques  
• DBMS Components  
 o Storage structures – primary, clustering, secondary, multi-level  
 o Query processing – overview, query transformation, query evaluation  
 o Transaction processing – overview, ACID properties, concurrency control – schedules, serializability, deadlocks  
• Other Topics  
 o Data warehouse  
 o Analytics

NIT\_Rourkela\_Syllabus.pdf

• Database Management Systems  
 o Introduction to Database systems  
 o Data Independence  
 o Data Models  
 o Levels of abstraction  
 o Structure of DBMS  
 o Relational Model  
 o Integrity constraints  
 o Relational Languages  
 o Query Languages: SQL, QUEL, QBE  
 o Aggregate operators  
 o Embedded and Dynamic SQL  
 o File Organization  
 o Storage  
 o Buffer management  
 o Record and page formats  
 o File organization techniques  
 o Indexing  
 o Query optimization  
 o Query processing on various operations  
 o Translating SQL queries  
 o Estimating the cost  
 o Database design  
 o E-R Model  
 o Functional dependencies  
 o Normalization  
 o Multi-valued dependencies  
 o Concurrency control and recovery  
 o Transaction  
 o Schedules  
 o Lock based concurrency  
 o Lock management  
 o Concurrency control without locking  
 o Crash recovery  
 o Log  
 o Check pointing  
 o Media recoveries  
 o Database Security  
 o Distributed databases design  
 o Object Oriented database design & its implementation  
 o Introduction to recent advances in database technology  
• Database Laboratory  
 o Study of SQL syntax  
 o Study of Oracle syntax  
 o Study of DB2 syntax  
 o Writing Views, Assertions, Triggers  
 o PL/SQL Programs  
 o Generating forms and reports  
 o Designing and querying databases using SQL  
 o Oracle and DB2: Order processing, insurance, student enrollment, library, banking enterprise  
 o Primary keys, data types and relevant queries  
 o Front end creation using VB, Java  
• Health Informatics  
 o Database management  
 o Introduction to data structure  
 o Elements, arrays, records, sets, tables  
 o Singly and doubly linked data  
 o Stacks, queues and trees  
 o Architecture of DBMS  
 o Representation of data  
 o Physical record interface  
 o Data models: relational, Hierarchical and network approach  
 o Data modeling techniques: relational, Hierarchical and network normalization techniques  
 o Data indexing and structuring techniques  
 o Integrity and security of database  
 o Information searching and retrieval  
 o Hospital information system  
 o Computerized hospital information system  
 o Computerized patient database management  
• Hospital Engineering and Information System  
 o Hospital Information system  
 o Role of database  
 o Need & Overview of Networking  
 o Topologies and its configuration  
 o Structuring medical records  
 o Computerization in pharmacy & billing  
 o Automated clinical laboratory systems & radiology information system