



COURSE HANDOUT

Session: 2025-2026

Sub Session: Semester II (Jan-Jun)

Course Name: Database Management Systems (CS 231)

L/T/P/C: 3/0/2/4

Course Incharge: Dr. Sachin Dube

Course Faculty:

Dr. Sachin Dube (sachin.dube@niituniversity.in)

Registered Batches:

B.Tech. - CSE 2020 , CSE 2022 , CYS 2022 , AI and DS 2024 , BT 2024 , CSE 2024 , CYS 2024

Course Description

This is an introductory course on relational database systems. Its aim is to introduce basic concepts of databases and database management systems. At the end of this course it is expected that students will have a reasonably good theoretical as well as practical foundation on database systems. In particular, they will have a good understanding of relational data model, relational query languages, and database processing, SQL and PLSQL, physical database, storage and indexing structures, transaction management, database recovery.

Course Outcomes

S.No.	Description
CO1	Demonstrate an understanding of the introductory concepts of data, and recognizing different forms of structured, unstructured, and semi-structured data. Comprehend the distinctions between data file systems and databases, grasping database system concepts, architecture, as well as logical and physical database concepts.
CO2	Apply relational algebra, relational calculus, and relational integrity concepts to solve complex problems. Effectively use SQL for crafting data definition, manipulation, and control commands, applying various types of joins, aggregate functions, and update operations with joins.
CO3	Analyse and evaluate the process of relational schema refinement and normalization, critically examining functional dependencies, keys, and normalization forms based on primary keys. Assess multi-value dependencies, join dependencies, and inclusion dependencies to ensure a thorough understanding of advanced relational design concepts.
CO4	Create comprehensive conceptual database designs using high-level conceptual modelling and ER modelling concepts. Design and implement database objects, and develop physical database designs.
CO5	Evaluate and assess transaction processing and concurrency control mechanisms, understanding transaction fundamentals in OLTP environments. Critically analyse and implement necessary properties of transactions (ACID properties). Evaluate and apply advanced database recovery techniques.

Course outcome mapping with Programme Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	2	2	2	2	2	2	2	2	2	2	2	2
Max.	3	3	3	3	3	3	3	3	3	3	3	3

3 is High, 2 is Moderate, 1 is Low & - is Not Applicable

AC Approved Course Content

The Academic Council approved course content will be filled in this section by the Academic Office.

Tentative Lecture Plan/ Activities

Units	Syllabus Details	Hours required to complete	Course Outcome
1	Introductory Concepts of Data - Transactional, Analytical and Master Data	1	CO1
2	Structured, Unstructured and Semi Structured Data	2	CO1
3	Data file and Database - Data File systems versus Database	1	CO1
4	Database system concepts and architecture along with logical database and physical database concepts	2	CO1
5	Relational Algebra and Relational Calculus - Relational model concepts	2	CO2
6	Relational integrity constraints, Temporal behavior of the Relational model concepts	2	CO2
7	Structured Query Language - data definition language, integrity constraints, data manipulation language, data control language	3	CO2
8	Simple queries, queries using Joins, using aggregate functions.	3	CO2
9	Joins - inner, left outer, right outer, full outer and cross joins. Updates and updates with joins.	3	CO2
10	Relational Schema Refinement and Normal Forms - Functional dependencies, Keys in a relational model, Normal forms based on primary keys, Boyce-Codd Normal Forms	2	CO3
11	Multi-values dependencies and fourth normal form, Join dependencies and fifth normal form, Inclusion dependencies	2	CO2, CO3
12	Conceptual Database Design - High-level conceptual modeling, ER Modeling concepts, ER Diagrams, Cardinality constraints	2	CO4
13	Higher-order relationships, ER to relational mapping	2	CO4
14	Database objects - Tables, Views	3	CO4
15	Triggers and Stored Procedures with PLSQL	3	CO4
16	Physical Database Design - Storage structures, Secondary storage devices, Buffering of blocks	2	CO4
17	File Organization, Heaps, Sorted Files, Indexing methods, Clustering index, Multilevel indexes	2	CO4
18	Tree based Indexing - B trees, B plus trees, inserting and searching algorithms for B plus trees, Hashing based - Hashing and overflow handling techniques, Dynamic hashing, Extensible hashing	2	CO4
19	Transaction Processing and Concurrency Control - Transaction Fundamentals in OLTP environments, Concurrency issues, need for transactions	2	CO5
20	Necessary properties of transactions (ACID properties), Transaction states, serializability, Cascading rollbacks, Concurrency control, Locking, Deadlocks and starvation	2	CO5
21	Database Recovery Techniques- Recovery concepts, Deferred updates technique, Immediate update technique, Shadow paging.	2	CO5
Total lectures/activities required		45*	

Book Details

Text Books

1. R. Ramakrishnan and J. Gehrke, Database Management Systems, 3rd edition, McGraw Hill, 2014, ISBN-10: 9339213114.
2. Henry F. Korth, Abraham Silberschatz, S. Sudarshan, Database System Concepts, 6th edition, Tata McGraw Hill 2013, ISBN-10: 9332901384)
3. R. Elmasri and S. B. Navathe, Fundamentals of Database Systems, 6th edition, Pearson Education

Reference Books

1. T. Connolly and C. Begg, A Practical Approach to Design, Implementation and Management, Database Systems: 4th edition, Pearson Education, 2008, ISBN-10: 813172025X.
2. C. J. Date, An Introduction to Database Systems, 8th edition, Addison Wesley, 2006, ISBN-10: 8177585568.
3. J. Melton, Understanding the New SQL: A Complete Guide, 2nd edition, Morgan Kaufmann Publishers, 1992, ISBN-10: 1558602453.
4. Henry F. Korth, Abraham Silberschatz, S. Sudarshan, Database System Concepts, 6th edition, Tata McGraw Hill 2013, ISBN-10: 9332901384).

Online course work/ Massive Open Online Course/ Open source web material

SQL handbook online

Evaluation Scheme (Theory/ Practical)

Evaluation Component	Exam Month	Exam Duration (in Hrs)	Mode of Examination	Weighted Marks
Attendance	Not Applicable	Not Applicable	Not Applicable	10.00
Mid Semester Examination	March	1.5	Pen-Paper with closed book	20.00
Comprehensive Examination	May	3	Pen-Paper with closed book	40.00
Lab Assignment	Not Applicable	Not Applicable	Not Applicable	15.00
Project Evaluation I	February	Not Applicable	Not Applicable	5.00
Project Evaluation II	April	Not Applicable	Not Applicable	10.00

Mode of Practical Exam

1. Continuous evaluation of lab assignment.
2. Projects will be evaluated through presentation.

List of Tentative Practical

1. Database installation and user creation
2. DDL statements
3. DML statements
4. Joins and DML
5. Aggregates and DML
6. Combination of Joins, Aggregates, Delete
7. Data time functions
8. ER diagrams
9. Converting ER into relations
10. Views and Triggers
11. Stored Procedures
12. Advanced Stored Procedures
13. DB Transactions
14. Physical Database Management
15. Deadlocks

Course outcome mapping with evaluation components:

CO	Comprehensive Examination	Lab Assignment	Mid Semester Examination	Project Evaluation I	Project Evaluation II
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CO2	1	2	3	3	3
CO3	2	2	3	3	3
CO4	3	2	1	2	3
CO5	3	2	1	2	3
Max.	3	2	3	3	3

3 is High, 2 is Moderate, 1 is Low & - is Not Applicable

Make up Policy

Students who are likely to miss a component of evaluation due to any genuine reason may be given a make-up for that component by the Course In-Charge. The students are required to approach the Course In-Charge immediately for the same before the conduct of the evaluation component. It is the responsibility of the student to approach the Course In-Charge. The Course In-Charge will not allow makeup, if a student approaches 7 days after the evaluation component (Student Handbook R 35).

Plagiarism

We are committed to uphold the standards of academic integrity and honesty. Plagiarism in any form is unacceptable and will be treated seriously (Student Handbook R 49).

Grading Policy

The marks obtained in all evaluation components will be aggregated, and the total will be converted into a letter grade or report in accordance with NIIT University's guidelines. Grading is relative and is generally aligned with the class average. Mid-Semester grades will be announced after the evaluation of the Mid-Semester Examination, as outlined in the Student Handbook (R 40 and R 41).

University Attendance Policy

As per attendance policy of NIIT University. For more details, kindly refer to the attendance policy in the student handbook.

Consultation Hours

Contact over email: sachin.dubey@niituniversity.in, I will be available for consultation every Wednesday from 11:30 AM to 01:30 PM. During this time, you can reach out to me with any questions or concerns you may have related to the DBMS course or any other academic matters.