**NIRMA UNIVERSITY**

**Institute of Technology**

**M Tech Computer Science and Engineering**

**Semester – I**

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| **Course Code** | 3CS1112 |
| **Course Name** | Advanced Database Systems |

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

1. assess various storage and retrieval methods through appropriate indexing
2. design and analyze efficiency of algorithms for database operations
3. comprehend contemporary database architectures and its relevant issues

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| **Syllabus:** | **Teaching Hours:** |
| **Unit I**  **Data storage:** Overview of RDBMS concepts**,** Basic File Structures, File Organization & Record formats, Heap sorted & Hashed Files, Buffer management, Disk Storage, Parallel Disk access with RAID, Modern Storage Architectures | **5** |
| **Unit II**  **Indexing Structures:** Single level and Multilevel Indexes, B Tree and B+ Tree Indexes, Hash and bitmap based indexing, Index Structures for Single Dimensional and Multidimensional Databases | **8** |
| **Unit III**  **Query Processing**: Query Execution, Algebra for Queries, Physical-Query-Plan-Operators, Algorithms for Database Operations, Algorithms for Joins and Sorting, hash and index based algorithms, Buffer Management, Parallel Algorithms for Relational Operators | **9** |
| **Unit IV**  **Query Optimization**: Algebraic Foundation for Improving Query Plans, Estimating Cost of Operations, Cost Based Plan Selection, Choosing Order of Joins, Optimization of Queries for Parallel, Distributed, Multidimensional and Text Database | **8** |
| **Unit V**  **Transactions, Concurrency control and Recovery:** Transaction scheduling, serializability, Coping with System Failure, Concurrency Control techniques with locking, timestamp ordering and multiversion, Redo and Undo log based recovery, recovery in multi database systems | **7** |
| **Unit VI**  **Advances in database systems:**Distributed database systems, fragmentation, replication and allocation techniques, NoSQL based systems: key-value based, document based, column based and Graph databases, Streaming SQL,Introduction to active, temporal, spatial, multimedia and deductive databases | **8** |

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 5 experiments to be incorporated.

**Suggested Readings^:**

1. RamezElmasri, Shamkant B Navathe, Fundamentals of Database System, Pearson Education
2. Garcia Molina, Ullman, Widom, Data Base System Implementation, Pearson education
3. Raghu Ramakrishnan& Johannes Gehrke, Database Management Systems, McGraw Hill
4. Silberschatz, Korth, Sudarshan, Database System Concepts, McGraw Hill
5. M.TamerOzsu, Patrick Valduriez, S.Sridhar, Principles of Distributed Database Systems, Pearson Education

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list