| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| **MCSE506L** | **Database Systems** | **3** | **0** | **0** | **3** |
| **Pre-requisite** | **NIL** | **Syllabus version** | | | |
| | | **1.0** | | | |

**Course Objectives**

1. To understand the underlying principles of Relational Database Management Systems
2. To focus on the modeling and design of secured databases and usage of advanced data models
3. To implement and maintain the structured, semi-structured, and unstructured data in an efficient database system using emerging trends

**Course Outcomes**

On completion of this course, students must be able to

1. Design and implement a database depending on the business requirements, considering various design issues
2. Understand the concepts of Indexing, Query optimization, transaction management, concurrency control, and recovery mechanisms
3. Learn to apply parallel and distributed databases in Real-time scenarios
4. Categorize and design the structured, semi-structured, and unstructured databases
5. Characterize the database threats and their countermeasures

| Module:1 | **Design and Implementation of Relational Model** | **6 hours** |
|---|---|---|
| Database System Concepts and Architecture, Entity-Relationship (ER) Modelling, Relational Model-Keys, and Integrity Constraints, Mapping ER model to Relational Schema, Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form | | |
| **Module:2** | **Query Processing and Transaction Management** | **6 hours** |
| Storage and File Structure, Indexing, Query processing, and Query Optimization, Transaction Management, Concurrency Control, Recovery | | |
| **Module:3** | **Parallel Databases and Distributed Databases** | **8 hours** |
| Parallel Database Architecture, Data partitioning strategy, Inter-Query, and Intra-Query Parallelism, Distributed Database Features, Distributed Database Architecture, Fragmentation, Replication, Distributed Query Processing, Distributed Transactions Processing | | |
| **Module:4** | **Spatial and Multimedia Databases** | **6 hours** |
| Spatial database concepts, Spatial data types, and models, Spatial operators and queries, Indexing in spatial databases, Multimedia database concepts, Automatic Analysis of Images, Object Recognition in Images, Semantic Tagging of Images | | |
| **Module:5** | **Semi-Structured Databases** | **6 hours** |
| Semi Structured databases- XML Schema-DTD- XPath- XQuery, Semantic Web, RDF, RDFS | | |
| **Module:6** | **Cloud and NoSQL Databases** | **6 hours** |
| Cloud databases- Data Storage Systems on the Cloud, Data Representation, Partitioning and Retrieving Data, Challenges with Cloud-Based Databases- NoSQL Data model: Aggregate Models, Document Data Model, Key-Value Data Model, Columnar Data Model, Graph-Based Data Model | | |
| **Module:7** | **Database Security** | **5 hours** |
| Database Security Issues, Security Models, Different threats to databases, Challenges to maintaining database security | | |
| **Module:8** | **Contemporary Issues** | **2 hours** |
| | | |

|  |  | **Total Lecture hours:** | **45 hours** |
|---|---|---|---|
|  |  |  |  |

| **Text Book(s)** |||
|---|---|
| 1 | Abraham Silberschatz, Henry F. Korth, and S. Sudharsan, "Database System Concepts", 7ʰ Edition, McGraw Hill, 2019. |
| 2 | R. Elmasri and S. Navathe, Fundamentals of Database Systems, 7th Edition, Addison-Wesley, 2016 |
| **Reference Books** ||
| 1 | Fawcett, Joe, Danny Ayers, and Liam RE Quin. "Beginning XML", Wiley India Private Ltd., 5th Edition, 2012 |
| 2 | Rigaux, Ph, Michel Scholl, and Agnes Voisard. "Spatial databases: with application to GIS". Morgan Kaufmann, 2002. |
| 3 | Dunckley L. Multimedia databases: An object relational approach. Addison-Wesley Longman Publishing Co., Inc.; 2003 Jan 1. |
| Mode of Evaluation: CAT / Written Assignment / Quiz / FAT ||

| Recommended by Board of Studies | 26-07-2022 |||
|---|---|---|---|
| Approved by Academic Council | No. 67 | Date | 08-08-2022 |