Indian Institute of Information and Technology, Allahabad

Database Security (Elective) **Total lectures: 42**

Credit hours: 3 **Program: M.Tech (CLIS) (3rd Sem)**

Course Objective

- To understand the security issues and solutions for Database, Multilevel Database, Distributed database, Outsourced Database and Data Warehouse.

Prerequisite: Introduction to Information Security
Database Management System

Syllabus:

Unit 1: Introduction to Database – Relational Database & Management System – ACID Properties, Normalization, RAID, Relational Algebra, Query tree, Data Abstraction (Physical Level, Logical Level & View Level) - Multi-level Database, Distributed Database [6 Lecture]

Unit 2: Security issues in Database – Polyinstantiation - Integrity Lock - Sensitivity Lock – Security Models – Access Control (Grant & Revoke Privileges) - Statistical Database, Differential Privacy. Distributed Database Security. [6 Lecture]

Unit 3: Outsourced Database and security requirements – Query Authentication Dimension – Condensed RSA, Merkle Tree, B^+ Tree with Integrity and Embedded Merkle B-Tree – Partitioning & Mapping - Keyword Search on Encrypted Data (Text file). [6 Lecture]

Unit 4: Security in Data Warehouse & OLAP – Introduction, Fact table, Dimensions, Star Schema, Snowflake Schema, Multi-Dimension range query, Data cube - Data leakage in Data Cube, 1-*d* inference and m-*d* inference – Inference Control Methods. [6 Lecture]

Unit 5: XML – Introduction about XML – Access Control Requirements, Access Control Models: Fine Grained XML Access Control System. [5 Lecture]

Unit 6: Geospatial Database Security – Geospatial data models – Geospatial Authorization, Access Control Models: Geo-RBAC, Geo- LBAC. [4 Lecture]

Unit 7: Privacy-Preserving Data Mining – Introduction - Randomization method: Privacy Quantification, Attacks on Randomization, Multiplicative Perturbations, Data Swapping - *K*-Anonymity framework – Distributed Privacy-Preserving Data Mining. [5 Lecture]

Unit 8: Database Watermarking – Basic Watermarking Process - Discrete Data, Multimedia, and Relational Data – Attacks on Watermarking - Single Bit Watermarking, Multi bit Watermarking. [5 Lecture]

Assignments: Review of recent methods to achieve the security in the Single Level Database, Multilevel Database, Distributed database, Outsourced Database, Data Warehouse and Big Data.

Tutorial: Supporting Technologies for Database and Application Security.

Reference Books

1. Michael Gertz and Sushil Jajodia (Editors), Handbook of Database Security: Applications and Trends , ISBN-10: 0387485325. Springer, 2007

2. Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, Ahmed I. Sallam, and Hala S. El-Sayed, Multilevel Security for Relational Databases by; ISBN 978-1-4822-0539-8. CRC Press, 2014.

3. Bhavani Thuraisingham, Database and Applications Security: Integrating Information Security and Data Management, CRC Press, Taylor & Francis Group, 2005.