# Indian Institute of Information and Technology, Allahabad

**Database Security (Elective)**                                    **Total lectures: 42**
**Credit hours: 3**                    **Program: M.Tech - CLIS (3rd Sem) / B.Tech -IT (7th 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, and Distributed database, Blockchain, Outsourced Database, Data Warehouse and Big Data.

**Tutorial**: Supporting Technologies for Database and Application Security.

**Reference Books**

1. Michael Gertz and SushilJajodia (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, <u>Multilevel Security for Relational Databases</u> by; ISBN 978-1-4822-0539-8. <u>CRC Press</u>, 2014.

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