



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3725610

Semester – II

Subject Name: Data Security and Access Control

Type of course: Elective

Prerequisite: Basic knowledge of DBMS, Distributed DBMS, and Information Security is required.

Rationale: Data security and access control is not confined to granting certain teams within a company or organization with different access levels or issuing of user passwords. Nowadays the smart cyber attackers can attack password protected systems. The other alternatives can be Two-factor authentication, logging into work systems and databases through biometrics, a one-time password. In an organization like bank a lot of data collected and stored, which can be used by data scientists. As data scientists, their jobs are not to run the whole security operation in their organizations. However, it is essential that we understand the importance of having good, robust mechanisms in place to prevent sensitive and personally identifiable information from getting into the hands unauthorized person. The subject covers various techniques of security data. User authentication is only one aspect of data security. The other aspect includes using anomaly detection algorithms or machine learning based approaches to detect unusual user activity and behavior.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Data security fundamentals: Introduction- Trends, Supporting technology for database and application security, Discretionary security in database systems, Multilevel secure data management, Multilevel secure relational data models and systems, Inference problem, Secure distributed database system, Secure object and multimedia data systems, Data warehousing, data mining security & privacy , Secure web information management technologies.	8	16
2	Security Architecture, Operating System Security Fundamentals, Administration of Users, Privileges, passwords, roles, Access control of relational databases, Access Control Models, Discretionary Access Control and Role-based Access Control in database management, Mandatory Access Control, Access control models for XML databases: policy language	10	21
3	Security Models: Access Matrix Model, Take-Grant Model, Bell and LaPadula's Model, Biba's Model, Sea View Model	6	13
4	A Methodological Approach to Security Software, Design Secure Operating System, Design Secure DBMS, Design Security Packages , Database Security	6	13



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Design			
5	Security policies: Access control policies, administration policies, identification and authentication, auditing a database system, views for security. Policy enforcement & related issues: Overview, SQL extensions for security, query modification, discretionary security and database functions, visualization of policies, prototypes and products	8	16
6	Statistical Database Protection & Intrusion Detection Systems : Introduction, Statistics Concepts and Definitions, Types of Attacks, Inference Controls evaluation Criteria for Control Comparison .Introduction IDES System, RETISS System, ASES System Discovery	4	8
7	Models For The Protection Of New Generation Database Systems – Introduction, A Model for the Protection of Frame Based Systems, A Model for the Protection of Object Oriented Systems, SORION, Model for the Protection of Object-Oriented Databases	6	13
Total		48	100%

Reference Books:

- 1) Bhavani Thuraisingham, Database & application security (Integrity information security & Data Management), Auer bach Publication Taylor &Francin Group
- 2) Williams Stallings, Lawrie Brown, Computer Security, 2nd Edition Prentice Hall, 2012.
- 3) Hassan A. Afyouni, Database Security and Auditing, Indian Edition, CENGAGE Learning, 2009.
- 4) Castano, Database Security, Second edition, Pearson Education.
- 5) Alfred Basta, Melissa Zgola, Database security, CENGAGE learning

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the threats on Database	10%
CO-2	Study various way of securing database from unauthorized users	10%
CO-3	Apply Secure Access of database	15%
CO-4	Use various tools to detect abnormal activities in specific account	20%
CO-5	Investigate the need and procedure of security audit	20%
CO-6	Implement the protection of new generation of DBMS	25%

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	5
Comprehension	5
Application	15
Analysis	25
Evaluate	25
Create	25



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Practical List:

- 1) Implement program for two factor authentication.
- 2) Implement program for biometric way of authentication.
- 3) Study and implement backup and recovery process for a database (mysql/oracle).
- 4) Study the working of firewall in Linux
- 5) Implement the SQL injection attack and suggest possible solutions.
- 6) Based on your recommendation, your boss, the manager of database administration has made the decision to move all database applications and databases to Oracle 11g. She has asked you to develop the security procedures since you are the only DBA familiar with Oracle security. You decide to set up the database security objects with the following rules:

Make an IST469User Role

This role can connect to the database

This role can select, insert, update, and delete data in the IST469 tablespace.

Make an IST469Developer Role

This role can connect to the database

This role can create, alter, and drop tables, sequences and views for the IST469 Schema.

This role can select, insert, update, and delete data in the IST469 tablespace.

Make an IST469User user

This user's default tablespace is IST469

This user has a 5 MB quota on IST469 tablespace.

This user is a member of the IST469User role

Make a IST469Dev user

This user's default tablespace is IST469

This user has unlimited quota on IST469 tablespace.

This user is a member of the IST469Developer role

Make a IST469DBA User

This user can perform all system dba functions including database startup and shutdown

This user can create and maintain tablespaces, roles, profiles, users and schemas.

This user can use OEM

This user has no other privileges. They cannot create and maintain any other database objects, such as tables, views, procedures, etc. They can also not add, read or change data from the tables.

List of Open Source Software/learning website:

- 1) MySQL
- 2) Oracle 11g Xpress edition
- 3) The Open Web Application Security Project, <http://www.owasp.org>
- 4) Web application security scanners , e.g. WebInspect (SPI Dynamics),
<http://www.windowsecurity.com/software/Web-Application-Security/>
- 5) SQL Injection, <http://www.cgisecurity.com/development/sql.shtml>