

# National Institute of Technology Jamshedpur – 831014

## Department of Computer Applications

Spring Semester (Session 2019-2020)

### Course Handout

<b>Batch</b>	:	<b>M. Tech (2<sup>nd</sup> Semester)</b>
<b>Course No.</b>	:	<b>CA4201</b>
<b>Course Title</b>	:	<b>Database Security</b>
<b>Instructor In-Charge</b>	:	<b>Dr. Chandrashekhar Azad</b>
<b>Contact</b>	:	<b>csazad.ca@nitjsr.ac.in</b>

#### **Course Description:**

##### **Unit-I**

**Security Architecture:** Introduction, Security, Information Systems, Database Management Systems, Information Security, Information Security Architecture, Database Security, Database Security Level, Menaces to Databases, Asset Type and Their Value, Security Methods, Database Security Methodology.

**Operating System Security Fundamentals:** Introduction, Operating System Overview, Operating System Security Environment, The Components of Operating System Security Environment: Services, Files, Files Permission, Files Transfer, Sharing Files, Memory. Authentication Methods, User Administration, Password policies, Vulnerabilities of Operating Systems, E- mail Security.

##### **Unit-II**

**Administration of Users:** Introduction, Documentation of User Administration, Operating System Authentication, Creating an Oracle10g user, Creating a SQL Server User, Removing Users, Modifying Windows Integrated Login Attributes; Modifying Users, Default Users, Remote Users, Database Links, Authentication Methods, Linked Servers, Remote servers.

**Profile, Password policies, Privileges and Roles:** Introduction, Defining and Using Profiles, Designing and implementing password Policies, Granting and revoking User Privileges, Creating assigning and Revoking User Roles, Creating Roles with Oracle, Creating Roles with SQL Server.

##### **Unit-III**

**Database Application Security Models:** Introduction, Types of Users, Security Modes, Application Types: Client/server, Applications, Web Applications, Data Warehouse Application, Other Applications; Application Security Models, Data Encryption.

**Virtual Private Databases:** Introduction, Overview of Virtual Private Databases, Implementing a VPD Using Views, Implementing a VPD Using Application Context in Oracle, Implementing Oracle Virtual Private Databases, Viewing VPD Policies and Application Context Using The Data Dictionary, Viewing VPD Policies and Application Contexts Using Policy Manager, Implementing Row- and Column-level Security with SQL Server.

##### **Unit-IV**

**Database Auditing Models:** Introduction, Auditing Environment, Auditing Process, Auditing Objectives, Auditing Classifications and Types, Benefits and Side Effects of Auditing, Auditing Models.

**Application Data Auditing:** Introduction, DML Action Auditing Architecture, Oracle Triggers, SQL Server Triggers, Fine-grained Auditing (FGA) with Oracle, DML Statement Audit Trail, Auditing Application Errors with Oracle, Oracle PL/SQL Procedure Authorization.

**Auditing Database Activities,** Introduction, Using Oracle Database Activities, Creating DLL Triggers with Oracle: Auditing Database Activities with Oracle, Auditing Server Activity with Microsoft SQL Server, Implementing SQL Profiler, Security Auditing with SQL Server.

##### **Scope:**

Database security concerns the use of a broad range of information security controls to protect databases (potentially including the data, the database applications or stored functions, the database systems, the database servers and the associated network links) against compromises of their confidentiality, integrity and availability. It involves various types or categories of controls, such as technical, procedural/administrative and physical. Database security is a specialist topic within the broader realms of computer security, information security and risk management.

**Objectives:**

The purpose of database security is to protect unauthorized accessing of data and misuses by hackers and unauthorized personals. So here the database security comes into the picture. Database security denotes the system, processes, and procedures that protect a database from unintended activity. Security is usually enforced through access control, auditing, and encryption.

**Course outcomes:**

- Students are able to design and implement access control rules to assign privileges and protect data in databases.
- Students are able to implement access control rule to secure data stored in databases.
- They use Oracle and Microsoft SQL server.
- Students implement Virtual Private Database to protect data in databases.
- Students implement database auditing.
- Students learn and practice various access control theories and techniques including mandatory access control, discretionary access control, role - based access control.
- Students are able to give a presentation and write reports.

**Text Book:**

1. Database Security and Auditing: Protecting data Integrity and accessibility, by Hassan Afyouni, Cengage Learning.

**Reference Book:**

1. Database and application Security, by Bhavani Thuraisingham, Auerbatch Publication, Taylor and Francis Group.
2. Implementing database security and auditing, Ron Ben Natan, Elsevier Digital Press.
3. Handbook of Database Security: Applications and Trends, Michael Gertz and Sushil Jajodia, Springer.
4. Oracle Database 12c Security, David Knox, Scott Gaetjen, and William Maroulis, McGraw Hill Professional.

**Course Plan**

Lect. No.	Topics to be covered	Learning Objectives	Refer to chapter see (text book)
1	Introduction, Technologies for Database and Applications Security	Overview- of database security	(chapter- 1)
2-4	Introduction, Security, Information Systems, Database Management Systems, Information Security, Information Security Architecture, Database Security, Database Security Level, Menaces to Databases, Asset Type and Their Value, Security Methods, Database Security Methodology.	Security Architecture	(chapter-1)
5-7	Introduction, Operating System Overview, Operating System Security Environment, The Components of Operating System Security Environment: Services, Files, Files Permission, Files Transfer, Sharing Files, Memory. Authentication Methods, User Administration, Password policies, Vulnerabilities of Operating Systems, E- mail Security.	Operating System Security Fundamentals	(chapter-2)
8-11	Introduction, Documentation of User Administration, Operating System Authentication, Creating an Oracle10g user, Creating a SQL Server User, Removing Users, Modifying Windows Integrated Login Attributes; Modifying Users, Default Users, Remote Users, Database Links, Authentication Methods, Linked Servers, Remote servers.	Administration of Users	(chapter-3)
11-16	Introduction, Defining and Using Profiles, Designing and implementing password Policies, Granting and revoking User Privileges, Creating assigning and Revoking User Roles, Creating Roles with Oracle,	Profile, Password policies, Privileges and Roles	(chapter-4)

	Creating Roles with SQL Server.		
17-21	Introduction, Types of Users, Security Modes, Application Types: Client/server, Applications, Web Applications, Data Warehouse Application, Other Applications; Application Security Models, Data Encryption.	Database Application Security Models	(chapter-5)
22-26	Introduction, Overview of Virtual Private Databases, Implementing a VPD Using Views, Implementing a VPD Using Application Context in Oracle, Implementing Oracle Virtual Private Databases, Viewing VPD Policies and Application Context Using The Data Dictionary, Viewing VPD Policies and Application Contexts Using Policy Manager, Implementing Row- and Column-level Security with SQL Server.	Virtual Private Databases	(chapter-6)
27-31	Introduction, Auditing Environment, Auditing Process, Auditing Objectives, Auditing Classifications and Types, Benefits and Side Effects of Auditing, Auditing Models.	Database Auditing Models	(chapter-7)
32-36	Introduction, DML Action Auditing Architecture, Oracle Triggers, SQL Server Triggers, Fine-grained Auditing (FGA) with Oracle, DML Statement Audit Trail, Auditing Application Errors with Oracle, Oracle PL/SQL Procedure Authorization.	Application Data Auditing	(chapter-8)
37-40	Introduction, Using Oracle Database Activities, Creating DLL Triggers with Oracle: Auditing Database Activities with Oracle, Auditing Server Activity with Microsoft SQL Server, Implementing SQL Profiler, Security Auditing with SQL Server.	Auditing Database Activities	(chapter-9)

**Evaluation Scheme (EC):**

EC No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
1.	Mid Term Examination	02 Hours	30%	Academic Calendar	Closed Book
2.	End Term Examination	03 Hours	50%	Academic Calendar	Closed Book
3.	Internal Assessment	--	20%	TBA	(Class Test, Attendance, Assignments/Reports/Projects/Seminars)
Class Test/Reports/Projects/Seminars - 10 Marks, Assignment- 05 Marks, Attendance & Punctuality in class- 05 Marks					

→ **Chamber consultation hour:** Monday to Friday, 5PM to 6PM, Faculty Chamber

→ **Notices:** All notices regarding the course will be displayed only on the Department of Computer Applications notice board

Instructor In-Charge  
**CA4201**