COURSE SYLLABUS

CSC12001 – Data Security in Information Systems

1. GENERAL INFORMATION

Course name:	Data Security in Information Systems
Course name (in Vietnamese):	An toàn và bảo mật dữ liệu trong hệ thống thông tin
Course ID:	CSC12001
Knowledge block:	Compulsory for Information System major
Number of credits:	4
Credit hours for theory:	45 (11 weeks)
Credit hours for practice:	30 (10 weeks)
Credit hours for self-study:	90
Prerequisite:	
Prior-course:	CSC10006 - Introduction to Databases
Instructors:	Dr. Phạm Thị Bạch Huệ; MSc. Lương Vĩ Minh

2. COURSE DESCRIPTION

The course is designed to provide students with the concepts of information security. Students understand that the database is an important part of an information system. The course presents an introduction to security issues and the threats to databases that are stored in trusted servers. The student can recognize the security requirements and apply the mechanisms such as user authentication, access control, data encryption, auditing for securing databases in real-world information systems. Students also study the context that the databases to be stored in untrusted servers which introduces a lot of security issues. The course provides some suggested solutions for each issue.

3. COURSE GOALS

At the end of the course, students are able to:

ID	Description	Program LOs
G1	Work independently or in group to apply security mechanisms of RDBMSs	2.1.1, 2.2.2, 1.3.7
G2	Perform the reading comprehension skills, present and write simple reports in English	2.3.1, 2.3.2, 2.4.3, 2.4.5
G3	Explain basic concepts in information security	1.3.6, 4.3.1, 4.3.2
G4	Recognize the security requirements in an information system.	1.3.6, 4.3.1, 4.3.2, 5.1.1
G5	Understand the principles of security schemes or mechanisms provided by RDBMSs for enforcing the security requirements in real-world information systems	4.1, 4.2, 4.3, 5.1, 5.2, 5.3
G6	Implement security mechanisms provided by DBMSs in real-world information systems.	5.3, 6.1, 6.2
G7	Describe SQL Injection attacks and operate defense methods.	1.3.6, 6.1, 6.2
G8	Explain security issues in ODBS (Outsourced Database Services) and apply security policies in an outsourced database.	1.3.6, 5.1, 5.2, 5.3

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1	Demonstrate independent work on quizzes and homework	T, U
G1.2	Demonstrate working in pair or group on the project	T, U
G2.1	Read technical documents in English on different chapters and summarize the key features	I, T, U
G2.2	Show the understanding on a given topic of information security or database security and its application via report writing	T, U
G3.1	Explain basic knowledge in information security	T, U

G4.1	Recognize the security requirements in an information system.	T, U
G5.1	Understand the principles of security schemes or security mechanisms provided by RDBMSs	I, T
G5.2	Enforce the security requirements (policies) in real-world information systems by using security mechanisms provided by a specific RDBMS.	I, T
G6.1	Implement a user authentication mechanism in a database using SQL Server or Oracle.	I, T
G6.2	Implement access control mechanisms in a database using SQL Server or Oracle.	I, T
G6.3	Implement cryptography in a database using SQL Server or Oracle.	I, T
G6.4	Execute auditing in a database using SQL Server or Oracle.	I, T
G7.1	Understand SQL Injection attacks	I, T
G7.2	Operating defense methods against the SQL Injection attacks	I, T
G8.1	Understanding security issues in ODBS (Outsourced Database Services)	I
G8.2	Discussing some suggested solutions for each security issue.	I

5. TEACHING PLAN

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)
1	Introduction to the course Chapter 01: An overview	G1.1, G1.2, G2.1, G2.2, G3.1	Lecturing Q&A, Group discussion
2	Chapter 02: User Authentication	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.1	Lecturing Demonstration, Q&A
3	Chapter 03: Access Control (Basic concepts - DAC - RBAC)	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.2	Lecturing Demonstration, discussion
4	Chapter 03: Access Control (VPD - MAC - OLS)	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.2	Lecturing Demonstration, discussion
5	Chapter 03: Access Control (OLS)	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.2	Lecturing Demonstration
6	Working in group on the given project	G4.1, G5.1, G5.2	Case study, analyze, Q & A, discussion
7	Chapter 04: Database Encryption	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.3	Question & answer Case study and discussion
8	Chapter 05: SQL Injection	G4.1, G5.1, G7.1, G7.2	Lecturing Demonstration
9	Chapter 06: Auditing	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G6.4	Lecturing Q&A, discussion
10	Chapter 07: Security Issues in ODBS	G1.1, G1.2, G2.1, G2.2, G4.1, G5.1, G8.1, G8.2	Lecturing, Q&A
11	Project Oral Test		Case study, demonstration

For the practical laboratory work, there are 10 weeks which cover similar topics as it goes in the theory class. Each week, teaching assistants will explain and demonstrate key ideas on the

corresponding topic and ask students to do their lab exercises either on a computer in the lab or at home. All the lab work submitted will be graded. There would be a final exam for lab work.

LABORATORY

ID	Topics	Course Outcomes	Teaching/ Learning activities
1	Guide to install DBMS and tools	G1.1, G1.2, G2.1, G2.2, G5.1, G5.2	Explain and demonstrate
2	Create a database and manage the resources	G1.1, G1.2, G2.1, G2.2, G5.1, G5.2	Provide instruction Explain and demonstrate
3	PL/ SQL	G1.1, G1.2, G2.1, G2.2, G5.1, G5.2	Provide instruction Explain and demonstrate
4	User authentication Authorization with DAC	G1.2, G2.1, G2.2, G3.1, G6.1, G6.2	Explain and demonstrate
5	RBAC (Role-based Access Control)	G1.2, G2.1, G2.2, G3.1, G6.2	Provide instruction Explain and demonstrate
6	VPD (Virtual Private Database)	G1.2, G2.1, G2.2, G3.1, G6.2	Provide instruction Explain and demonstrate
7	OLS (Oracle Label Security)	G1.2, G2.1, G2.2, G3.1, G6.2	Provide instruction Explain and demonstrate
8	SQL Injection	G1.2, G2.1, G2.2, G3.1, G7.1	Provide instruction Explain and demonstrate
9	Database Encryption	G1.2, G2.1, G2.2, G3.1, G6.3	Provide instruction Explain and demonstrate
10	Auditing	G1.2, G2.1, G2.2, G3.1, G6.4	Provide instruction Explain and demonstrate

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A1	**Exams**			**45%**
A11	Midterm exam	Describe the understanding on a given topic, analyze a given problem.	G1.1, G1.2, G2.2, G2.2, G3.1, G4.1, G5.1, G5.2, G6.1, G7.1, G7.2	10%
A12	Final exam	Oral-test. Describe the understanding of different topics, analyze & suggest the solution for a given problem	G3.1, G4.1, G5.1, G5.2, G6.1, G6.2, G6.3, G6.4	35%
A2	**Projects**			**30%**
A21	Project	Identify the security requirements of a given information system. Analyze and enforce the security policies.	G4.1, G5.1, G5.2, G6.1, G6.2, G6.3, G6.4	30%
A3	**Laboratory**			**25%**
A31	Lab assignments		G4.1, G5.1, G5.2, G6.1, G6.2, G6.3, G6.4, G7.1, G7.2	25%

7. RESOURCES

Reference materials

[1]. *Fundamentals of Database Systems*, Chapter 30, 7th edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education Limited, 2017.

[2]. Oracle Corporation's Document Site: http://docs.oracle.com/

[3]. D.C. Knox, Effective Oracle Database 10g Security by Design, Oracle Press.

Other resources

SQL Server or Oracle

8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than 3 theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss the topics. However, individual work must be done and submitted on your own.