ACADEMIC PLANNER

Subject: DATABASE SECURITY

(1) OBJECTIVES AND RELEVANCE

The main objective of this subject to find security – design techniques of database security, security software design.

- Understand and explain the place of database security in the context of security analysis and management.
- Understand, explain and apply the security concepts relevant to database systems.
- Understand, identify and find solutions to security problems in database systems.
- Understand the basic language of security mechanisms as applied to database systems.
- Analyze access control requirements and perform fairly simple implementations using SQL.
- Appreciate the limitations of security subsystems.

(2) SCOPE

Database security is defined as the degree to which data is fully protected from unauthorized tempering. Information security is protecting data and information; it is based on the confidentiality, integrity and availability.

(3) PREREQUISITES

This course is intended to prepare you to understand the underlying database security and information security to protect the data and information. DBMSs from different vendors vary in distinct implementation and architecture, the basic function of DBMS is to enable developers and administrators to organize data: store, manipulate, and retrieve data efficiently; enforce data referential integrity; and provides a security mechanism to protect the data.

(4.1) *SYLLABUS - JNTU*

UNIT-I

SYLLABUS

Introduction

Introduction to database security, Problems in databases, Security controls conclusions.

Security models-1

Introduction, Access matrix model, Take grant model, Acten model, PN model, Hartson and Hsiao's model, Fernandez's model, Bussolati and marttella's model for distributed databases.

UNIT - II

SYLLABUS

Security models-2

Bell and Lapadula's model,Biba's model,Dion's model, Sea view model, jajodia and sandhu's model, The Lattice model for the flow control conclusion.

Security mechanisms

Introduction, user identification/Authentication, Memory protection, Resource protection, Control Flow Mechanisms, Isolation, Security Functionalities in some operating systems, Trusted Computer System Evaluation Criteria

UNIT – III

SYLLABUS

Security software design

Introduction- A Methodological Approach to security software design, Secure Operating System design, Secure DBMS Design, Security Packages, Database Security Design.

Statistical database protection and 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.

UNIT - IV

SYLLABUS

Models for the protection of new generation database systems-1

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

UNIT – V

SYLLABUS

Models for the protection of new generation database systems-2

A model for the protection of new generation database systems: the orion model, jajodia and kogan's model, A model for the protection of Active Databases, Conclusions

(4.2) SYLLABUS – GATE

NOT APPLICABLE

(4.3) SYLLABUS - IES

NOT APPLICABLE

(5) SUGGESTED BOOKS

TEXT BOOKS

T1. Database security by Pearson Edition (1/e)

T2. Database security and auditing: Protecting Data Integrity and Accessibility, 1st edition, Hasson Afyouni, Thomson Edition

REFERENCE BOOKS

R1. Database security by Alfred basta, Melissa zgola, CENGAGE learning.

(6) WEBSITES

Do not confine yourself to the list of websites mentioned here alone. Be cognizant and keep yourself abreast of the others too. The given list is not exhaustive.

1. https://www.tutorialspoint.com/db2/db2_database_security.html
2. https://docs.oracle.com/cd/b19306_01/server.102/b14220/security.html
3. https://study.com/academy/lesson/database-security management.html
4. https://www.slideshare.net/alraee/database-security
5. https://www.cse.iitb.ac.in/infolab/data/courses/cs632/.../dbsecurity-overview.ppt
6. https://people.eecs.ku.edu/~hossein/teaching/fa07/710/lectures/db-security.ppt
7. www.cs.sjsu.edu/faculty/lee/cs157b/fall2003/database_security.ppt
8. https://www.cs.kent.ac.uk/people/staff/saf/dbdc/portfolios/.../formal%20lecture.ppt
9. www5.csudh.edu/eyadat/classes/cis471/handouts/.../database%20security.ppt

(7) EXPERT DETAILS

The Expert Details which have been mentioned below are only a few of the eminent ones known Internationally, Nationally and Locally. There are a few others known as well.

INTERNATIONAL

1. Nedhal A. Al-Sayid
   Science Dept.,
   Faculty of Information Technology,
   Applied Science University,
   Amman, Jordan

2. E. Bertino
   Dept. of Comput. Sci. & Electr. & Comput. Eng.,
   Purdue Univ.,
   West Lafayette, IN, USA

NATIONAL

1. Castano, s ct al,
   Database security
   Addition Wesley: Reading, ma, 1995

(8) JOURNALS

INTERNATIONAL

1. IEEE transactions on dependable and secure computing, vol. 2, no. 1, January-march 2005

2. International Journal of Policy Levels Concerning Database Security

NATIONAL

1. Journal of Information Technology Education on Database Security: What Students Need to Know

(9) SUBJECT (LESSON) PLAN

S.NO	Topic (JNTU syllabus)	Sub-Topic	NO. OF LECTURES REQUIRED	Suggested Books	Remarks
UNIT - I					
1	Introduction:	Introduction to database security	L1	T1,R1	
2		Problems in database	L2-L3	T1, T2	
3		Security control conclusions	L4-L5	T1	
4		Security models-1 Introduction,Access matrix model	L6-L7	T1	
5		Take grant model	L8	T1	
6		Acten model	L9-L10	T1	
7		PN model, Hartson and hsiao's model	L11	T1	
8		Fernandez's model, Bussolati and Martella's model for distributed databases	L12	T1	Unit-I completed

UNIT - II					
9	**Security models-2 and security mechanisms**	Bell and Lapadula's model	**L13**	**T1**	
10		Biba's model	**L14**	**T1, R1**	
11		Dions model, Sea view model	**L15**	**T1, R1**	
12		Jajodia and Sandhu's model,The lattice model for the Flow control Conclusion	**L16**	**T1, R1**	
13		Security mechanisms, Introduction and user identification/Authentication	**L17**	**T1**	
14		Memory protection	**L18**	**T1, R1**	
15		Resource protection	**L19**	**T1**	
16		Control flow mechanisms, Isolation	**L20**	**T1**	
17		Security functionalities in some operating systems	**L21**	**T1**	
18		Trusted computer System evaluation Criteria	**L22**	**T1, T2**	**II UNIT COMPLETED**
UNIT -III					
19	**Security software design and Statistical database**	Introduction, Secure operating system design	**L23-L24**	**T1**	
20		Semantic networks Secure DBMS design	**L25-L26**	**T1**	
21		Security packages	**L26-L27**	**T1**	

22	**protection and intrusion detection systems**	Database security design	**L28-L29**	**T1**	
23		introduction and statistics concepts and definitions	**L30**	**T1, T2**	
24		Types of attacks, Inference Controls	**L31-L33**	**T1**	**III UNIT COMPLETED**
25		Evaluation criteria for control comparison	**L34-L35**	**T1**	
26		RETISS System, ASES System Discovery	**L36**	**T1**	
UNIT –IV					
27	**Models for the protection of new generation database systems-1**	Introduction, A model for the protection of frame based systems	**L37**	**T1, T2**	
28		A model for the protection of object oriented systems :SORIAN	**L38**	**T1**	
29		A model for the protection of object oriented databases	**L39**	**T1, T2**	**IV UNIT COMPLETED**
UNIT –V					
30	**Models for the protection of new generation database systems-2**	A Model for the protection of new generation database systems : The orion model	**L40-L41**	**T1**	
31		Jajodia and Kogan's model	**L42**	**T1, T2**	
32		A model for the protection of Active databases, conclusions	**L43**	**T1, R1**	**V UNIT COMPLETED**

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1. Each Period is of 50 minutes.

2. Each unit duration & completion should be mentioned in the Remarks Column.
3. List of Suggested books can be marked with Codes like T1, T2, and R1 etc.

Course Outcomes

CO1	***Ability to carry out a risk analysis for large database***
CO2	***Ability to setup and maintain the accounts with privileges and roles***
CO3	***Describe at least one integrity auditing technique for outsourced databases***
CO4	***Create secure authentication procedures for web application users***

(10) QUESTION BANK

UNIT-1

1. Define the term database? Discuss the need for security?(CO1)
2. What is database security? Explain some of the problems in database security?(CO1)
3. Describe database security controls?(CO1)
4. Discuss the following security models for distributed databases(CO2)
   (i) Acten model
   (ii) Fernandez's model
5. Explain any three security models for distributed databases in detail?(CO2)
6. Explain clearly the take grant model,PN model and Fernandez's model for database security?(CO2)

UNIT-II

1. Discuss Bell and LaPadula's security model?(CO2)
2. Explain in detail about Biba's model? How is different from Bell and LaPadula's model?(CO2)
3. Explain the security model proposed by Jajodia and sandhu?(CO2)
4. Illustrate Lattice model for flow control(CO3)
5. What is the need for user identification,Discuss authentication mechanisms in detail?(CO3)

6. Brielfly explain about the paging technique?(CO1)
7. Explain how trusted computer system provides security?(CO2)

UNIT-III

1. Explain the methodological approach to security software design?(CO2)
2. Describe in detail the Kernelized secure operating system?(CO1)
3. Explain the Virtual Machine Monitor security kernel in detail?(CO2)
4. Discuss database security design in detail?(CO2)
5. Give a note on security packages?(CO1)
6. List and explain various types of attacks on databases?(CO1)
7. Write briefly about inference control and list and explain different techniques of inference control?(CO1)
8. Explain in detail IDES system?(CO3)
9. Write short notes on ASES system discovery?(CO1)

UNIT-IV

1. Explain in detail about the elements of active databases?(CO3)
2. Discuss the model for the protection of frame based systems in detail?(CO2)
3. Discuss the models for protection of frame based systems and object-oriented systems?(CO2)
4. Discuss model for the protection of object oriented systems and object oriented data bases?(CO2)

UNIT-V

1. Write briefly about the ORION authorization model and subjects if it?(CO1)
2. Explain briefly about authorizations?(CO3)
3. Discuss the Jajodia and Kogan's model for protecting databases?(CO2)
4. Explain the model for the protection of active databases?(CO4)

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(11) ASSIGNMENT QUESTION SETS ON EACH UNIT

SHORT QUESTIONS **(2M)**

1. Write short notes on database and database security?
2. Define Biba's model?
3. Define threat.Mention types of threats?
4. Define Access matrix model?
5. Write the difference between paging and segmentation?
6. Write short notes on Data hiding and Inheritance?
7. Write short notes on Jajodia and Kogan's model?
8. Write short notes on frame based systems?
9. Define OODBMS?
10. Write short notes on ORION authorization model?
11. Write any four features of Acten model?
12. What is meant by DION model?
13. Write short notes on polyinstantiation integrity?
14. List and explain different user types in RACF?
15. Explain the operation modes of CA-ACF2?
16. Write short notes statistical database?
17. Write short notes on restriction based techniques?
18. Discuss in detail about views?
19. Write the properties of multiple inheritances?
20. Write the rules for deriving strong authorization?
21. Write short notes on authorization propagation?
22. List out operations of modifying access matrix?
23. Define paging?
24. Discuss briefly about the setropts password commands?
25. Write short notes on restriction based techniques?

LONG QUESTIONS **(10M)**

1. Define the term database? Discuss the need for security?
2. What is database security? Explain some of the problems in database security?
3. Describe database security controls?
4. Discuss the following security models for distributed databases

(iii) Acten model

(iv) Fernandez's model

5. Explain any three security models for distributed databases in detail?
6. Explain clearly the take grant model,PN model and Fernandez's model for database security?
7. Discuss Bell and LaPadula's security model?
8. Explain in detail about Biba's model? How is different from Bell and LaPadula's model?
9. Explain the security model proposed by Jajodia and sandhu?
10. Illustrate Lattice model for flow control
11. What is the need for user identification,Discuss authentication mechanisms in detail?
12. Brielfly explain about the paging technique?
13. Explain how trusted computer system provides security?
14. Explain the methodological approach to security software design?
15. Describe in detail the Kernelized secure operating system?
16. Explain the Virtual Machine Monitor security kernel in detail?
17. Discuss database security design in detail?
18. Give a note on security packages?
19. List and explain various types of attacks on databases?
20. Write briefly about inference control and list and explain different techniques of inference control?
21. Explain in detail IDES system?
22. Write short notes on ASES system discovery?
23. Explain in detail about the elements of active databases?
24. Discuss the model for the protection of frame based systems in detail?
25. Discuss the models for protection of frame based systems and object-oriented systems?
26. Discuss model for the protection of object oriented systems and object oriented data bases?
27. Write briefly about the ORION authorization model and subjects if it?
28. Explain briefly about authorizations?
29. Discuss the Jajodia and Kogan's model for protecting databases?
30. Explain the model for the protection of active databases?

(12) TOPICS FOR STUDENT'S SEMINARS

- Database security
- Security software design
- Protection of object oriented databases

THE END