(9001360) Database Security

Version: 2024

Course Attributes

- **Course Number:**
- **Grade Level:**
- **Course Length:**
- **SOC Codes:**

9001360

3

1 Hours

Program Primary SOC: 151212 - Network and Computer Systems Administrators

Additional SOCs: *Refer to the Related Careers (SOC Codes) section*

Course Structure

Database Security

The outline below shows the structure of this Course, including all its requirements and optional components.

Parent
9001360 Database Security
0 Child Components - 0 Required

Related Careers (SOC Codes)

The career titles and SOC codes listed below are based on the 2018 Standard Occupational Classification (SOC) system, which is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. Students completing this program, including required and optional program components, will learn valuable concepts and skills related to the following career(s).

Parent
9001360 Database Security

- **Primary SOC Code**

    151212 - Network and Computer Systems Administrators

- **Secondary SOC Code**

Standards and Benchmarks

National Standards:

9001360 Database Security

This course focuses on strategies employed to mitigate data compromise, including design, access, and deployment of databases.

CTE-IT.912.9001360.1 - Demonstrate an understanding of database design, structure, and operation.
Demonstrate an understanding of database design, structure, and operation.

CTE-IT.912.9001360.1.1
Describe a relational database and its key elements.

CTE-IT.912.9001360.1.2
Describe the Entity Relationship Model (ERM) and relate how it is a factor in database security.

CTE-IT.912.9001360.1.3
Describe the process of normalization and explain its role in database security.

CTE-IT.912.9001360.1.4
Differentiate between one-to-many, many-to-many and one-to-one relationships.

CTE-IT.912.9001360.1.5
Define referential integrity and describe its implications on database security.

CTE-IT.912.9001360.1.6
Discuss the role of authentication in database security.

CTE-IT.912.9001360.2 - Demonstrate a fundamental understanding of Structured Query Language (SQL).
Demonstrate a fundamental understanding of Structured Query Language (SQL).

CTE-IT.912.9001360.2.1
List the capabilities of SQL SELECT statements.

CTE-IT.912.9001360.2.2
Execute basic SQL statements, including SELECT, INSERT, and UPDATE.

CTE-IT.912.9001360.2.3
Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.

CTE-IT.912.9001360.2.4
Use column aliases to rename columns in the query result.

CTE-IT.912.9001360.2.5
Use SQL to display the structure of a table.

CTE-IT.912.9001360.2.6
Apply SQL syntax to restrict the rows returned from a query.

CTE-IT.912.9001360.2.7
Demonstrate application of the WHERE clause syntax.

CTE-IT.912.9001360.2.8
Apply the proper comparison operator to return a desired result.

CTE-IT.912.9001360.2.9
Create, drop, rename and truncate tables using SQL.

CTE-IT.912.9001360.2.10
Create and remove an index using a SQL statement.

CTE-IT.912.9001360.2.11
Create or modify users and roles using SQL statements.

CTE-IT.912.9001360.2.12
Use the GRANT and REVOKE SQL statements to control access.

CTE-IT.912.9001360.2.13
Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) SQL statements and discuss their respective implications to database security.

CTE-IT.912.9001360.3 - Demonstrate an understanding of database security policies.
Demonstrate an understanding of database security policies.

CTE-IT.912.9001360.3.1
Explain the role of the Database Management System (DBMS) in maintaining database security.

CTE-IT.912.9001360.3.2
Describe three aspects of system level security related to databases (i.e., user privilege schema, user authentication, operating system level privileges).

CTE-IT.912.9001360.3.3
Describe the mechanisms that control access to and use of the database at the object level.

CTE-IT.912.9001360.3.4

Explain how role-based privilege assignment can be used as a data security model.

CTE-IT.912.9001360.3.5

Compare and contrast the implications of connecting to a database with administrator versus user privileges.

CTE-IT.912.9001360.4 - Demonstrate an understanding of database access control, functions, methods, and verification.

Demonstrate an understanding of database access control, functions, methods, and verification.

CTE-IT.912.9001360.4.1

Compare and contrast rights and privileges as they relate to database security.

CTE-IT.912.9001360.4.2

Describe the manner in which database user rights and privileges are controlled (e.g., granted, revoked).

CTE-IT.912.9001360.4.3

Describe application access rights and discuss their role in a database security schema.

CTE-IT.912.9001360.4.4

Compare and contrast table, column, and row level security, including VIEW implications.

CTE-IT.912.9001360.4.5

Describe fine-grained access control and its use in database security.

CTE-IT.912.9001360.4.6

Describe the operation of a database firewall and explain its role in a database security schema.

CTE-IT.912.9001360.4.7

Describe how database security policies may be used to trigger security auditing events.

CTE-IT.912.9001360.4.8

Describe the various types of auditing (e.g., statement, privilege, object, fine-grained) and associated records.

CTE-IT.912.9001360.5 - Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.

Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.

CTE-IT.912.9001360.5.1

Describe the SQL Injection attack vector and explain its potential consequences (e.g., privilege escalation, data compromise, data destruction).

CTE-IT.912.9001360.5.2

Describe database inference as a vulnerability and explain how sensitive information can be compromised inadvertently.

CTE-IT.912.9001360.5.3

Discuss ways in which to prevent or limit database inference at design time and query time.

CTE-IT.912.9001360.5.4

Compare and contrast the various countermeasures and strategies to prevent an SQL injection from being successful.

CTE-IT.912.9001360.5.5

Compare and contrast the ways in which encryption might be applied to a database (i.e., database, fields, records, columns) and discuss the tradeoffs of each.

CTE-IT.912.9001360.6 - Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.

Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.

CTE-IT.912.9001360.6.1

Describe the criteria which might be employed to trigger an intrusion or breach alarm.

CTE-IT.912.9001360.6.2

Identify the sources for confirming and tracking intrusion.

CTE-IT.912.9001360.6.3

Describe the tools and methodologies used to determine the scope of data compromise.

CTE-IT.912.9001360.6.4

Assess an intrusion, determine the scope of compromise, and restore compromised data.

CTE-IT.912.9001360.6.5

Describe the appropriate actions related to database recovery during incidence response.

Related CTE Program

0511100315:   Applied Cybersecurity

This course focuses on strategies employed to mitigate data compromise, including design, access, and deployment of databases.

State Adopted Instructional Materials

[Author(s)], ([Copyright]), [Title] ([Edition] ed.), [Publisher].

CPALMS Educational Resources

Click HERE to access more than [XXXX] CPALMS-approved educational resources aligned to the standards and benchmarks in this CTE program.

(9001380) Web Security

Version: 2024

Course Attributes

- **Course Number:**
- **Grade Level:**
- **Course Length:**
- **SOC Codes:**

9001380

3

1 Hours

Program Primary SOC: 151212 - Network and Computer Systems Administrators

Additional SOCs: *Refer to the Related Careers (SOC Codes) section*

Course Structure

Web Security

The outline below shows the structure of this Course, including all its requirements and optional components.

Parent
9001380 Web Security
0 Child Components - 0 Required

Related Careers (SOC Codes)

The career titles and SOC codes listed below are based on the 2018 Standard Occupational Classification (SOC) system, which is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. Students completing this program, including required and optional program components, will learn valuable concepts and skills related to the following career(s).

Parent
9001380 Web Security

- **Primary SOC Code**

  151212 - Network and Computer Systems Administrators

- **Secondary SOC Code**

Standards and Benchmarks

National Standards:

9001380 Web Security

This course addresses the creation of secure websites and authentication applications, including identifying the vulnerabilities and mitigation strategies.

CTE-IT.912.9001380.1 - Demonstrate an understanding of the primary security services used in Internet and intranet environments.
Demonstrate an understanding of the primary security services used in Internet and intranet environments.

CTE-IT.912.9001380.1.1
Describe Secure Sockets Layer (SSL) security service.

CTE-IT.912.9001380.1.2
Compare and contrast SSL with Transport Layer Security (TLS) as a security service.

CTE-IT.912.9001380.1.3
Describe Internet Protocol Security (IPsec) and discuss its benefits and three functional areas (i.e., authentication, confidentiality, key management).

CTE-IT.912.9001380.1.4
Describe Secure/Multipurpose Internet Mail Extension (S/MIME) and discuss its role in achieving secure Internet-based communications.

CTE-IT.912.9001380.2 - Demonstrate a fundamental understanding of the SSL protocol stack and its elements.
Demonstrate a fundamental understanding of the SSL protocol stack and its elements.

CTE-IT.912.9001380.2.1
Compare and contrast SSL Connection and SSL Session.

CTE-IT.912.9001380.2.2
Describe SSL Record Protocol services and discuss their role in managing SSL exchanges (i.e., message integrity, confidentiality).

CTE-IT.912.9001380.2.3
Describe the operation of the SSL Record Protocol, including the key steps that ensure security (e.g., adding message authentication code, encryption).

CTE-IT.912.9001380.2.4
Explain the role of the SSL Change Cipher Spec Protocol in ensuring secure transactions.

CTE-IT.912.9001380.2.5
Explain the role of the SSL Alert Protocol.

Describe the SSL Handshake Protocol and explain the role of each phase of communication (i.e., establish security capability, server authentication/key exchange, client authentication/key exchange, complete secure connection).

CTE-IT.912.9001380.3 - Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.

Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.

CTE-IT.912.9001380.3.1

Compare and contrast IPsec with SSL and TSL.

CTE-IT.912.9001380.3.2

Compare and contrast security services provided under IPv4 and IPv6.

CTE-IT.912.9001380.3.3

Differentiate between the three facilities available under IPsec (i.e., Authentication Header, Encapsulating Security Payload, key exchange).

CTE-IT.912.9001380.3.4

Describe the concept of Security Association (SA) and explain the roles of its three parameters (i.e., Security Parameters Index, IP Destination Address, Security Protocol Identifier).

CTE-IT.912.9001380.3.5

Describe the purpose, structure, and criteria of the Authentication Header (AH).

CTE-IT.912.9001380.3.6

Describe the purpose, structure, and elements of the Encapsulating Security Protocol (ESP).

CTE-IT.912.9001380.3.7

Describe the structure and operation of the key management facility of IPsec.

CTE-IT.912.9001380.4 - Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.

Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.

CTE-IT.912.9001380.4.1

Describe the role of S/MIME in conducting email communications.

CTE-IT.912.9001380.4.2

Compare and contrast the four new security functions provided by S/MIME (i.e., enveloped data, signed data, clear-signed data, and signed enveloped data).

CTE-IT.912.9001380.4.3

Outline the process of using S/MIME during email processing.

CTE-IT.912.9001380.4.4

Describe the various cryptographic algorithms used by S/MIME and discuss their applicability (i.e., DSS, RSA, SHA-1, MD5, ElGamal, AES, 3DES, HMAC).

CTE-IT.912.9001380.4.5

Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).

CTE-IT.912.9001380.4.6

Describe the need for using x.509 v3 public key certificates with S/MIME.

CTE-IT.912.9001380.5 - Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network.

Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network.

CTE-IT.912.9001380.5.1

Compare and contrast the roles and operation of a Kerberos Authentication Server (AS) and a Ticket Granting Server (TGS).

CTE-IT.912.9001380.5.2

Describe a Kerberos realm and the mechanism for inter-realm authentication.

CTE-IT.912.9001380.6 - Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.

Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.

CTE-IT.912.9001380.6.1

Describe the key components of identity management architecture.

CTE-IT.912.9001380.6.2

Describe the concept of identity federation and explain its benefits.

CTE-IT.912.9001380.6.3

Describe the standards used in federated identity management (i.e., XML, SOAP, WS-Security, SAML).

Related CTE Program

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