SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
Program Name: B. Tech		**Assignment Type: Lab**	**Academic Year:**2025-2026
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Course Code	24CS002PC215	**Course Title**	AI Assisted Coding
Year/Sem	II/I	**Regulation**	R24
Date and Day of Assignment	Week10 - Monday	**Time(s)**	
Duration	2 Hours	**Applicable to Batches**	
AssignmentNumber:20.1(Present assignment number)/**24**(Total number of assignments)			

Q.No.	Question	*Expected Time to complete*
1	**Lab 20 – Security Testing: Identifying Vulnerabilities in AI-Generated Code** **Lab Objectives:** • Understand how to test AI-generated code for common security vulnerabilities. • Learn to apply secure coding principles while analyzing AI	Week10 - Monday

outputs.

- Practice detecting risks such as **SQL injection, XSS, hardcoded credentials, and weak encryption**.
- Enhance code reliability and safety by using AI for secure refactoring.

Task 1 – Input Validation Check

Task:

Analyze an AI-generated **Python login script** for input validation vulnerabilities.

Instructions:

- Prompt AI to generate a simple username-password login program.
- Review whether input sanitization and validation are implemented.
- Suggest secure improvements (e.g., using re for input validation).

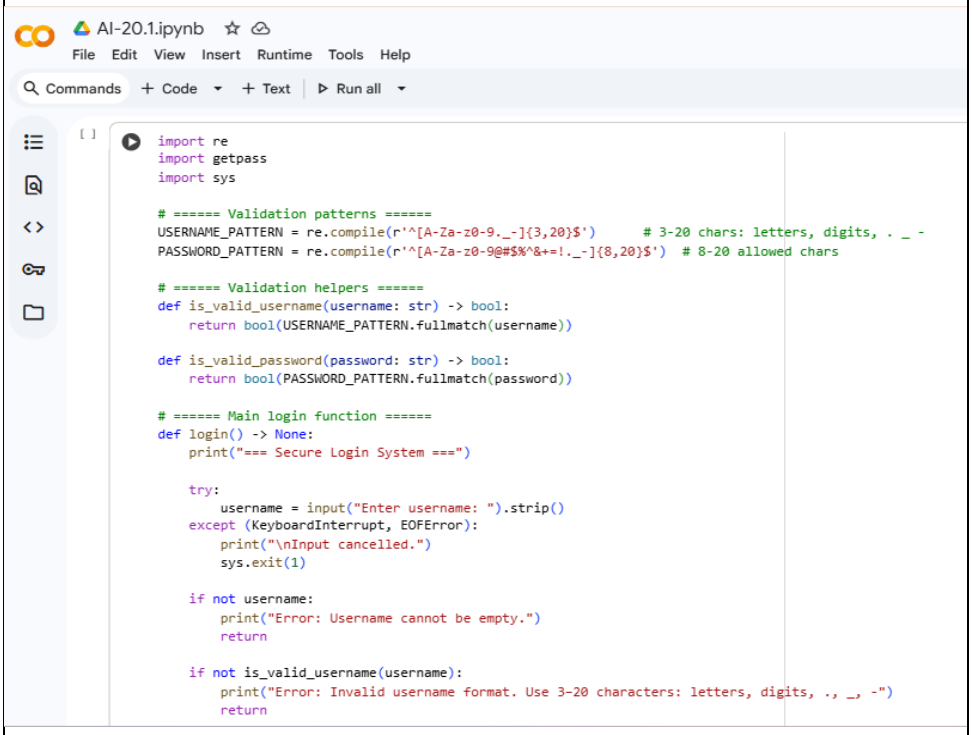
Expected Output:

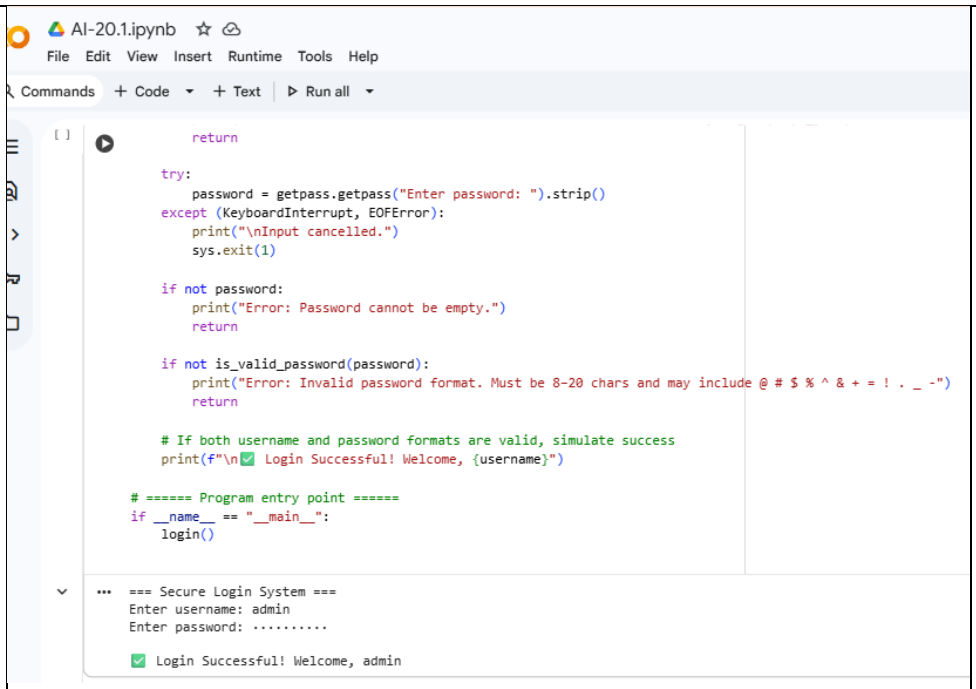
- A secure version of the login script with proper input validation.

Prompt:

Generate a simple Python username-password login program, check if it properly validates and sanitizes user input, identify any input validation vulnerabilities, and provide a secure improved version using regular expressions (re) for validation.

Code:





Task 2 – SQL Injection Prevention

Task:

Test an AI-generated script that performs SQL queries on a database.

Instructions:

- Ask AI to generate a Python script using SQLite/MySQL to fetch user details.
- Identify if the code is vulnerable to **SQL injection** (e.g., using string concatenation in queries).
- Refactor using **parameterized queries (prepared statements)**.

Expected Output:

- A secure database query script resistant to SQL injection.

Prompt:

Generate a Python script that fetches user details from a database, check for SQL injection vulnerabilities, and provide a secure version using parameterized queries.

Code:

Generate a Python scripts to fetch user details for SQLite and MySQL. Explains the SQL injection risk in the insecure method. Usernames are validated with regex, with safe error handling and connection closure. A short demo seeds an SQLite DB, attempts an injection (admin' OR '1'='1), and shows the outcomes of both approaches.

```python
import sqlite3
import textwrap
import sys

SAMPLE_USERS = [
    ("admin", "Admin@123", "Site Administrator"),
    ("alice", "Alice#2024", "Alice Wonderland"),
    ("bob", "Bob$2023", "Bob Builder"),
    ("mallory", "Mallory!9", "Mallory Attacker"),
]

def initialize(conn: sqlite3.Connection) -> None:
    """Create table and populate sample users (clears previous rows each run)."""
    with conn:
        cur = conn.cursor()
        cur.execute("""
            CREATE TABLE IF NOT EXISTS users (
                id INTEGER PRIMARY KEY AUTOINCREMENT,
                username TEXT UNIQUE NOT NULL,
                password TEXT NOT NULL,
                full_name TEXT
            )
        """)
        cur.execute("DELETE FROM users")  # ensure clean state for demo
        cur.executemany(
            "INSERT INTO users (username, password, full_name) VALUES (?, ?, ?)",
            SAMPLE_USERS
        )

def vulnerable_fetch(conn: sqlite3.Connection, uname: str):
    """
    Intentionally insecure: builds SQL by inserting user input directly.
    Demonstrates how an attacker can change query semantics.
    """
    cur = conn.cursor()
    sql = "SELECT id, username, full_name FROM users WHERE username = '{}';".format(uname)
    print("\n[RUNNING VULNERABLE QUERY]")
    print(sql)
    try:
        cur.execute(sql)
        return cur.fetchall()
    except Exception as e:
        return f"Query error: {e}"

def safe_fetch(conn: sqlite3.Connection, uname: str):
    """
    Secure: parameterized query using '?' placeholder (sqlite3).
    The DB driver treats uname as data, not executable SQL.
    """
    cur = conn.cursor()
    sql = "SELECT id, username, full_name FROM users WHERE username = ?;"
    print("\n[RUNNING SAFE PARAMETERIZED QUERY]")
    print(sql, "params:", (uname,))
    try:
        cur.execute(sql, (uname,))
```

```
        return cur.fetchall()
    except Exception as e:
        return f"Query error: {e}"

def display_result(result):
    """Nicely print query results or messages."""
    if isinstance(result, str):
        # error message
        print(result)
        return
    if not result:
        print("No rows returned.")
        return
    print("Rows returned:")
    for r in result:
        print(f"  id={r[0]}, username={r[1]}, full_name={r[2]}")

def prompt_once(prompt_text="Enter the user name: "):
    """Prompt the user once and return the stripped string (or exit on Ctrl+C/EOF)."""
    try:
        return input(prompt_text).strip()
    except (KeyboardInterrupt, EOFError):
        print("\nInput cancelled. Exiting.")
        sys.exit(0)

def demo():
    conn = sqlite3.connect(":memory:")
    initialize(conn)

    print("Demo DB initialized with users:", ", ".join(u[0] for u in SAMPLE_USERS))
    print(textwrap.dedent("""
        You will be prompted to enter a username once.
        After you input it, the script will show results from:
         1) a vulnerable query (string interpolation) and
         2) a safe parameterized query
        Finally the demo runs a known injection payload to highlight the difference.
    """))

    # The single prompt you asked for:
    user_input = prompt_once("Enter the user name: ")

    # Vulnerable run
    print("\n--- Vulnerable lookup (using your input) ---")
    vuln_res = vulnerable_fetch(conn, user_input)
    display_result(vuln_res)

    # Secure run
    print("\n--- Secure lookup (same input) ---")
    safe_res = safe_fetch(conn, user_input)
    display_result(safe_res)

    # Demonstrate an explicit injection payload
    injection = "admin' OR '1'='1"
    print("\n--- Demonstrating explicit injection payload (no prompt) ---")
    print("Payload:", injection)
```

```
        print("\nVulnerable with injection payload:")
        vuln_inj = vulnerable_fetch(conn, injection)
        display_result(vuln_inj)

        print("\nSecure with injection payload:")
        safe_inj = safe_fetch(conn, injection)
        display_result(safe_inj)

        conn.close()
        print("\nDemo finished.")

    if __name__ == "__main__":
        demo()
```

```
Demo DB initialized with users: admin, alice, bob, mallory

You will be prompted to enter a username once.
After you input it, the script will show results from:
 1) a vulnerable query (string interpolation) and
 2) a safe parameterized query
Finally the demo runs a known injection payload to highlight the difference.

Enter the user name: bob

--- Vulnerable lookup (using your input) ---

[RUNNING VULNERABLE QUERY]
SELECT id, username, full_name FROM users WHERE username = 'bob';
Rows returned:
  id=3, username=bob, full_name=Bob Builder

--- Secure lookup (same input) ---

[RUNNING SAFE PARAMETERIZED QUERY]
SELECT id, username, full_name FROM users WHERE username = ?; params: ('bob',)
Rows returned:
  id=3, username=bob, full_name=Bob Builder

--- Demonstrating explicit injection payload (no prompt) ---
Payload: admin' OR '1'='1

Vulnerable with injection payload:

[RUNNING VULNERABLE QUERY]
SELECT id, username, full_name FROM users WHERE username = 'admin' OR '1'='1';
Rows returned:
  id=1, username=admin, full_name=Site Administrator
  id=2, username=alice, full_name=Alice Wonderland
  id=3, username=bob, full_name=Bob Builder
  id=4, username=mallory, full_name=Mallory Attacker

Secure with injection payload:

[RUNNING SAFE PARAMETERIZED QUERY]
SELECT id, username, full_name FROM users WHERE username = ?; params: ("admin' OR '1'='1",)
No rows returned.

Demo finished.
```

Task 3 – Cross-Site Scripting (XSS) Check

Task:

Evaluate an AI-generated **HTML form with JavaScript** for XSS vulnerabilities.

Instructions:

- Ask AI to generate a feedback form with JavaScript-based output.
- Test whether untrusted inputs are directly rendered without escaping.
- Implement secure measures (e.g., escaping HTML entities, using CSP).

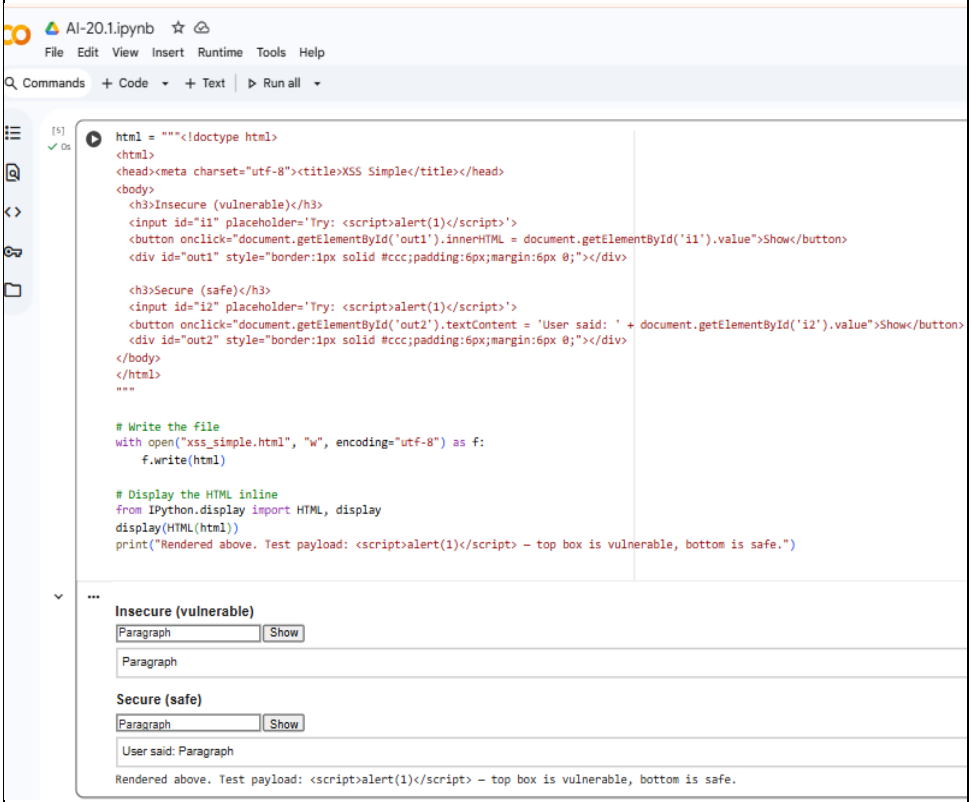
Expected Output:

- A secure form that prevents XSS attacks.

Prompt:

Generate an HTML feedback form with JavaScript that displays user input, show an insecure version that renders input directly (vulnerable to XSS) and a secure version that escapes or uses textContent and includes a CSP.

Code:



Task 4 – Real-Time Application: Security Audit of AI-Generated Code

Scenario: Students pick an **AI-generated project snippet** (e.g., login form, API integration, or file upload).

Instructions:

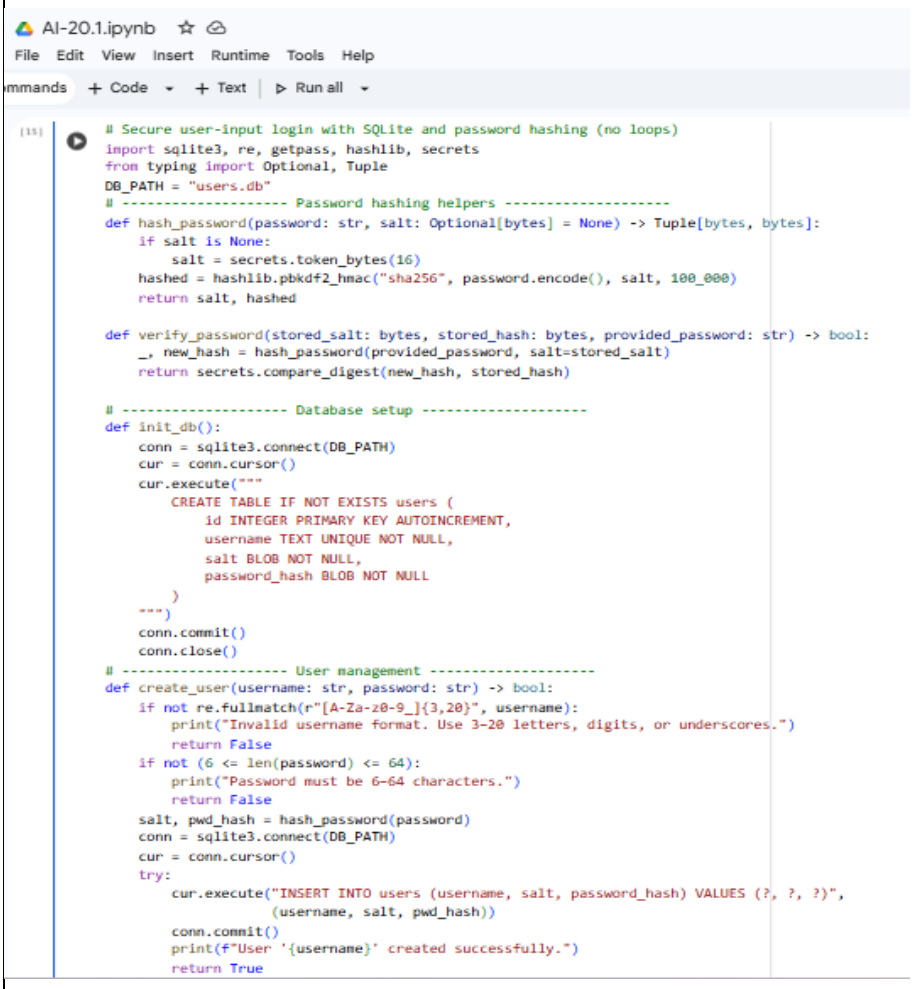
- Perform a security audit to detect possible vulnerabilities.
- Prompt AI to suggest **secure coding practices** to fix issues.
- Compare insecure vs secure versions side by side.

Expected Output:

- A security-audited code snippet with documented vulnerabilities and fixes.

Prompt: Generate a short AI-based project snippet (login form, API call).Check it for common security vulnerabilities, including input validation issues, insecure API handling.

Code:



```
        except sqlite3.IntegrityError:
            print("Username already exists.")
            return False
        finally:
            conn.close()
    def get_user_record(username: str):
        conn = sqlite3.connect(DB_PATH)
        cur = conn.cursor()
        cur.execute("SELECT id, username, salt, password_hash FROM users WHERE username = ?", (username,))
        row = cur.fetchone()
        conn.close()
        return row
    # -------------------- Login flow --------------------
    def login_prompt():
        username = input("Enter username: ").strip()
        if not re.fullmatch(r"[A-Za-z0-9_]{3,20}", username):
            print("Invalid username format.")
            return
        password = getpass.getpass("Enter password: ")
        record = get_user_record(username)
        if not record:
            print("No such user or wrong credentials.")
            return
        _, _, salt, pwd_hash = record
        if verify_password(salt, pwd_hash, password):
            print("Login successful!")
        else:
            print("Invalid username or password.")
    if __name__ == "__main__":
        init_db()
        # Create a single user
        print("\n--- Create a New User ---")
        new_user = input("New username: ").strip()
        new_pass = getpass.getpass("New password: ")
        create_user(new_user, new_pass)
        # Attempt login once
        print("\n--- Login ---")
        login_prompt()
```

```
--- Create a New User ---
New username: srikar
New password: ··········
Username already exists.

--- Login ---
Enter username: srikar
Enter password: ··········
Login successful!
```

✅ Deliverables (For All Tasks)

1. AI-generated prompts for code and test case generation.
2. At least 3 assert test cases for each task.
3. AI-generated initial code and execution screenshots.
4. Analysis of whether code passes all tests.
5. Improved final version with inline comments and explanation.
6. Compiled report (Word/PDF) with prompts, test cases, assertions, code, and output.