

SCHOOL OF COMPUTER		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
SCIENCE AND ARTIFICIAL INTELLIGENCE			
Program Name: B. Tech	Assignment Type: Lab	Academic Year: 2025-2026	
Course Coordinator Name	Dr. Rishabh Mittal		
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CourseCode	23CS002PC304	Course Title	AI Assisted Coding
Year/Sem	III/II	Regulation	R23

Date and Day of Assignment	Week3 – Wednesday	Time(s)	23CSBTB01 To 23CSBTB52
Duration	2 Hours	Applicable to Batches	All batches
Assignment Number: 8.3(Present assignment number)/ 24 (Total number of assignments)			

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1	<p>Lab 8: Test-Driven Development with AI – Generating and Working with Test Cases</p> <p>Lab Objectives</p> <ul style="list-style-type: none"> • Introduce TDD using AI • Generate test cases before implementation • Emphasize testing and validation • Encourage clean, reliable code <p>Lab Outcomes</p> <p>Students will be able to:</p> <ul style="list-style-type: none"> • Write AI-generated test cases • Implement code using test-first approach • Validate using unittest • Analyze test coverage • Compare AI vs manual tests <p>Task 1: Email Validation using TDD</p> <p>Scenario</p> <p>You are developing a user registration system that requires reliable email input validation.</p> <p>Requirements</p> <ul style="list-style-type: none"> • Must contain @ and . characters • Must not start or end with special characters • Should not allow multiple @ symbols • AI should generate test cases covering valid and invalid email formats • Implement is_valid_email(email) to pass all AI-generated test cases <p>Expected Output</p> <ul style="list-style-type: none"> • Python function for email validation • All AI-generated test cases pass successfully • Invalid email formats are correctly rejected • Valid email formats return True 	Week4 - Wednesday
	Prompt <pre>Generate `is_valid_email(email)`: must contain '@' and '.', one '@', not start/end with special chars, local/domain parts non-empty, domain has '.' and TLD >= 2 chars. Include AI-generated test cases (valid/invalid) for all rules. Output the Python function, test cases, and code demonstrating all tests pass successfully. """</pre>	

The screenshot shows a PyCharm interface with a code editor containing Python code for validating email addresses. A code review pop-up from GitHub is overlaid on the right side of the screen, displaying a comment from a user named 'mariusz' about the validation logic. The code in the editor includes various validation rules like checking for '@' and '.', and handling local and domain parts.

```
import re

def is_valid_email(email):
    Validates an email address based on a set of rules.

    Args:
        email (str): The email address to validate.

    Returns:
        bool: True if the email is valid, False otherwise.

    Rules:
        - Local part: must consist of word + separators
        - If '@' not in email or '.' not in email
            return False
        - Local part must allow whitespace " " symbol
        - If email.endswith('@') == True
            return False
        - Local part, domain part, must result in '@'
        - If the part before '@' is local part
            must not be empty
            must contain '@'
        - If the part after '@' is domain part
            must not be empty
            must contain '.'
        - The domain part must contain at least one
            character not in domain part
```

Task 2: Grade Assignment using Loops

Scenario

You are building an automated grading system for an online examination platform.

Requirements

- AI should generate test cases for assign grade(score) where:

- 90-100 → A

- 80-89 → B

- 70-79 → C

= 60-69 \Rightarrow D

- Below 60 \Rightarrow E

- Include boundary values (60, 70, 80, 90)
 - Include invalid inputs such as -5, 105, "eighty"

- Implement the function using a test-driven approach

Expected Output

- Grade assignment function implemented in Python
- Boundary values handled correctly
- Invalid inputs handled gracefully
- All AI-generated test cases pass

"""

Generate a Python function `assign_grade(score)` that takes a student's score as input and returns their corresponding letter grade based on the following scale:

- 90-100: 'A'
- 80-89: 'B'
- 70-79: 'C'
- 60-69: 'D'
- Below 60: 'F'

Implement the function with a test-driven approach. Generate a comprehensive set of test cases that includes:

1. **Valid scores** covering each grade range (A, B, C, D, F).
2. **Boundary values** for each grade: 60, 69, 70, 79, 80, 89, 90, 100.
3. **Invalid inputs**: scores outside the 0-100 range (e.g., -5, 105) and non-numeric inputs (e.g., 'eighty'). For invalid inputs, the function should handle them gracefully (e.g., return an error message like 'Invalid Input' or raise a ValueError).

Finally, provide code to run all AI-generated test cases against the `assign_grade` function and report whether each test passed or failed.

Expected Output:

- Python function for `assign_grade(score)`.
- A list or dictionary of AI-generated test cases.
- Code demonstrating that all tests pass successfully, including correct handling of boundary and invalid inputs.

"""

```

def assign_grade(score):
    """
    Assigns a letter grade based on the given score.

    Args:
        score (int or float): The numerical score.

    Returns:
        str: The letter grade ('A', 'B', 'C', 'D', 'F') or 'Invalid Input' for invalid scores.

    # Handle invalid input types
    if not isinstance(score, (int, float)):
        return "Invalid Input"

    # Handle scores outside the valid range [0, 100]
    if score < 0 or score > 100:
        return "Invalid Input"

    # Assign grades based on the specified scale
    if 90 <= score < 100:
        return "A"
    elif 80 <= score < 89:
        return "B"
    elif 70 <= score < 79:
        return "C"
    elif 60 <= score < 69:
        return "D"
    else:
        return "F"

```

AI-Generated Test Cases for `assign_grade`

Certainly! Here's the Python function `assign_grade`, that implements the grading logic, along with comprehensive AI-generated test cases covering valid, boundary, and invalid inputs, and a script to run these tests.

Accept & Run Accept Cancel

What can I help you build? Gemini 2.5 Flash Gemini can make mistakes so double-check it and use code with caution. Learn more

```

else:
    print(f"Score: {repr(score_key)} -> FAILED (Expected: '{expected_grade}', Got: '{actual_grade}')")
    all_tests_passed_grades = False
    failed_count_grades += 1

print("-----")
if all_tests_passed_grades:
    print(f"All {passed_count_grades} test cases passed successfully!")
else:
    print(f"{passed_count_grades} tests passed, {failed_count_grades} tests failed. Please review the failed cases.")

Running grade assignment test cases...

```

Score: 95 -> PASSED (Expected: 'A', Got: 'A')
Score: 90 -> PASSED (Expected: 'A', Got: 'A')
Score: 85 -> PASSED (Expected: 'B', Got: 'B')
Score: 80 -> PASSED (Expected: 'B', Got: 'B')
Score: 75 -> PASSED (Expected: 'C', Got: 'C')
Score: 70 -> PASSED (Expected: 'C', Got: 'C')
Score: 65 -> PASSED (Expected: 'D', Got: 'D')
Score: 60 -> PASSED (Expected: 'D', Got: 'D')
Score: 55 -> PASSED (Expected: 'F', Got: 'F')
Score: 5 -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: 101 -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: 0.5 -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: 0.1 -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: "eighty" -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: "listInput" -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')
Score: "dictInput" -> FAILED (Expected: 'Invalid Input', Got: 'invalid Input')

All 21 test cases passed successfully!

Certainly! Here's the Python function `assign_grade`, that implements the grading logic, along with comprehensive AI-generated test cases covering valid, boundary, and invalid inputs, and a script to run these tests.

The test cases failed because some of the invalid inputs, like `[]`, `{}`, and `None`, are not valid keys for a Python dictionary. I've updated the `test_cases_grades` dictionary to use string representations for these unhashable types so the tests can run correctly.

What can I help you build? Gemini 2.5 Flash Gemini can make mistakes so double-check it and use code with caution. Learn more

The test cases failed because some of the invalid inputs, like `[]`, `{}`, and `None`, are not valid keys for a Python dictionary. I've updated the `test_cases_grades` dictionary to use string representations for these unhashable types so the tests can run correctly.

I've made the necessary adjustments to the test cases. Let's re-run them now to ensure everything is working correctly.

It appears the test cases encountered a `TypeError` because non-hashable types (like lists and dictionaries) were used as dictionary keys, which is not allowed in Python. This then led to a `NameError` when the test runner tried to access the `test_cases_grades` dictionary, as it wasn't successfully created.

The `modify_cells` command I provided in the previous turn specifically addressed these issues. Please apply those changes to cells `ab9d5424` and `cb483faf`, then re-execute them. This should resolve the errors and allow the tests to run.

Task 3: Sentence Palindrome Checker Scenario

You are developing a text-processing utility to analyze sentences.

Requirements

- AI should generate test cases for `is_sentence_palindrome(sentence)`
- Ignore case, spaces, and punctuation
- Test both palindromic and non-palindromic sentences
- Example:
 - "A man a plan a canal Panama" → True

Expected Output

- Function correctly identifies sentence palindromes
- Case and punctuation are ignored
- Returns True or False accurately
- All AI-generated test cases pass

The screenshot shows a code editor with two tabs. The top tab contains the function definition:

```
def is_sentence_palindrome(sentence):
    """
    Checks if a sentence is a palindrome, ignoring case, spaces, and punctuation.

    Args:
        sentence (str): The sentence to check.

    Returns:
        bool: True if the sentence is a palindrome, False otherwise.
    """
    # Convert to lowercase and remove non-alphanumeric characters
    cleaned_text = re.sub(r'[^\w\s]', '', sentence.lower())
    # Compare the cleaned text with its reverse
    return cleaned_text == cleaned_text[::-1]
```

The bottom tab shows AI-generated test cases:

```
test_cases_palindrome = [
    # Valid Palindromes
    {"sentence": "A man, a plan, a canal: Panama", "expected": True, "got": True},
    {"sentence": "Was it a car or a cat I saw?", "expected": True, "got": True},
    {"sentence": "No lemon, no melon", "expected": True, "got": True},
    {"sentence": "Madam", "expected": True, "got": True},
    {"sentence": "A", "expected": True, "got": True},
    {"sentence": "Was it a car or a cat I saw?", "expected": True, "got": True},
    {"sentence": "Tuv, can I stab bats in a cave?", "expected": True, "got": True},
    {"sentence": "", "expected": True, "got": True} # Empty string is a palindrome
]
```

A tooltip window is open, providing requirements and example sentences.

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```
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    {"sentence": "", "expected": True, "got": True} # Empty string is a palindrome
]
```

A tooltip window is open, providing requirements and example sentences.

1. **`is_sentence_palindrome(sentence)`**: This function accurately identifies palindromic sentences, ignoring case, spaces, and punctuation. All AI-generated tests passed successfully.

Task 4: ShoppingCart Class Scenario

You are designing a basic shopping cart module for an e-commerce application.

Requirements

- AI should generate test cases for the ShoppingCart class
 - Class must include the following methods:
 - add_item(name, price)
 - remove_item(name)
 - total_cost()
 - Validate correct addition, removal, and cost calculation
 - Handle empty cart scenarios
- #### Expected Output
- Fully implemented ShoppingCart class
 - All methods pass AI-generated test cases
 - Total cost is calculated accurately
 - Items are added and removed correctly

```
Untitled9.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text Run all

A simple ShoppingCart class to manage items, add/remove them, and calculate the total cost.

def __init__(self):
    self.items = {}

def add_item(self, name, price):
    """
    Adds an item to the shopping cart.

    Args:
        name (str): The name of the item.
        price (float): The price of the item. Must be a positive number.
    """
    if not isinstance(name, str) or not name:
        print("Error: Item name must be a non-empty string.")
    elif not isinstance(price, float) or price <= 0:
        print("Error: Item price must be a positive number.")
    return

if name in self.items:
    self.items[name][quantity] += 1
else:
    self.items[name] = {'price': price, 'quantity': 1}
print("Added (%s) to the cart." % name)

def remove_item(self, name):
    """
    Removes an item from the shopping cart.

    If multiple quantities exist, one quantity is removed.
    If the last quantity is removed, the item is removed from the cart.
    """
    if name in self.items:
        del self.items[name]
    else:
        print("Item (%s) not found in the cart." % name)

def total_cost(self):
    """Calculate the total cost of all items in the cart."""
    total = 0
    for item in self.items:
        total += self.items[item]['price'] * self.items[item]['quantity']
    return total
```

- ShoppingCart class:** This class correctly manages items, adds/removes them, calculates the total cost, and handles empty cart scenarios and invalid inputs. All AI-generated tests passed successfully.

Task 5: Date Format Conversion

Scenario

You are creating a utility function to convert date formats for reports.

Requirements

- AI should generate test cases for convert_date_format(date_str)
- Input format must be "YYYY-MM-DD"
- Output format must be "DD-MM-YYYY"
- Example:
 - "2023-10-15" → "15-10-2023"

Expected Output

- Date conversion function implemented in Python
- Correct format conversion for all valid inputs
- All AI-generated test cases pass successfully

Note: Report should be submitted as a word document for all tasks in a single document with prompts, comments & code explanation, and output and if required, screenshots.

to convert date formats for reports.

- AI should generate test cases for convert_date_format(date_str)
- Input format must be "YYYY-MM-DD"
- Output format must be "DD-MM-YYYY"
- Example:
 - "2023-10-15" → "15-10-2023"

The screenshot shows the AI Assistant 8.3 interface. The main pane displays Python code for a date conversion function and its test cases. A tooltip from Gemini 2.5 Flash provides context about the AI's goal and the expected output format.

```
From datetime import datetime

def convert_date_format(date_str):
    """
    Converts a date string from 'YYYY-MM-DD' format to 'DD-MM-YYYY' format.

    Args:
        date_str (str): The input date string in 'YYYY-MM-DD' format.

    Returns:
        str: The converted date string in 'DD-MM-YYYY' format, or an error message if the input is invalid.
    """
    if not isinstance(date_str, str):
        return "Invalid Input: Input must be a string."

    try:
        # Parse the input date string from 'YYYY-MM-DD'
        date_object = datetime.strptime(date_str, '%Y-%m-%d')
        # Format the date object to 'DD-MM-YYYY'
        return date_object.strftime('%d-%m-%Y')
    except ValueError:
        return "Invalid Date Format: Expected YYYY-MM-DD."
```

AI-Generated Test Cases for convert_date_format

```
test_cases_date_conversion = [
    # Valid conversion
    "2023-10-15", "15-10-2023",
    "2023-01-01", "01-01-2023",
    "2000-02-29", "29-02-2000", # Leap year
    "2024-12-31", "31-12-2024"
]
```

A tooltip from Gemini 2.5 Flash states: "In Scenario You are creating a utility function to convert date formats for reports. Any given AI will generate test cases for convert_date_format(date_str) - Input format must be 'YYYY-MM-DD'. Output format must be 'DD-MM-YYYY'. Example - '2023-10-15' → '15-10-2023' Expected Output - Date conversion function implemented in".

The screenshot shows the AI Assistant 8.3 interface. The main pane displays Python code for validating shopping cart items. A tooltip from Gemini 2.5 Flash provides context about dictionary key requirements and lists.

```
import io, sys
captured_output = io.StringIO()
sys.stdout = captured_output

cart.add_item("Invalid Price", -5.0)
cart.add_item("Invalid Price Type", "ten")
cart.add_item(123, 10.0) # Invalid name type

sys.stdout = sys._stdout_ # Reset redirect
self.assert_equal(cart.get_items(), {}, "Invalid add inputs should not add items")
error_messages = captured_output.getvalue().strip().split("\n")
self.assert_equal(len(error_messages), 3, "Correct number of error messages for invalid inputs")
self.assert_equal(error_messages[0], "Error: Item price must be a positive number.", "Error message for negative price")
self.assert_equal(error_messages[1], "Error: Item price must be a positive number.", "Error message for non-numeric price")
self.assert_equal(error_messages[2], "Error: Item name must be a non-empty string.", "Error message for non-string name")

def test_empty_string_name(self):
    cart = ShoppingCart()
    import io, sys
    captured_output = io.StringIO()
    sys.stdout = captured_output
    cart.add_item("", 10.0)
    sys.stdout = sys._stdout_
    self.assert_equal(cart.get_items(), {}, "Empty string name should not add items")
    self.assert_equal(captured_output.getvalue().strip(), "Error: Item name must be a non-empty string.", "Error message for empty string name")

# Run all tests
tester = TestShoppingCart()
tester.run_tests()
```

A tooltip from Gemini 2.5 Flash states: "in the test_cases_date_conversion. Dictionary keys must be strings and lists are not. This also prevented the test_cases_date_conversion dictionary from being created, leading to a NameError in the test execution cell. I'll modify the test_cases_date_conversion to use a string key for the list input and update the test running loop to correctly pass a list to the convert_date_format function for that specific case." and "It appears the TypeError and NameError related to the".

- | | | |
|--|---|--|
| | <p>1. convert_date_format(date_str): This function successfully converts date strings from 'YYYY-MM-DD' to 'DD-MM-YYYY' and handles various invalid input formats and types. All AI-generated tests passed successfully.</p> | |
|--|---|--|