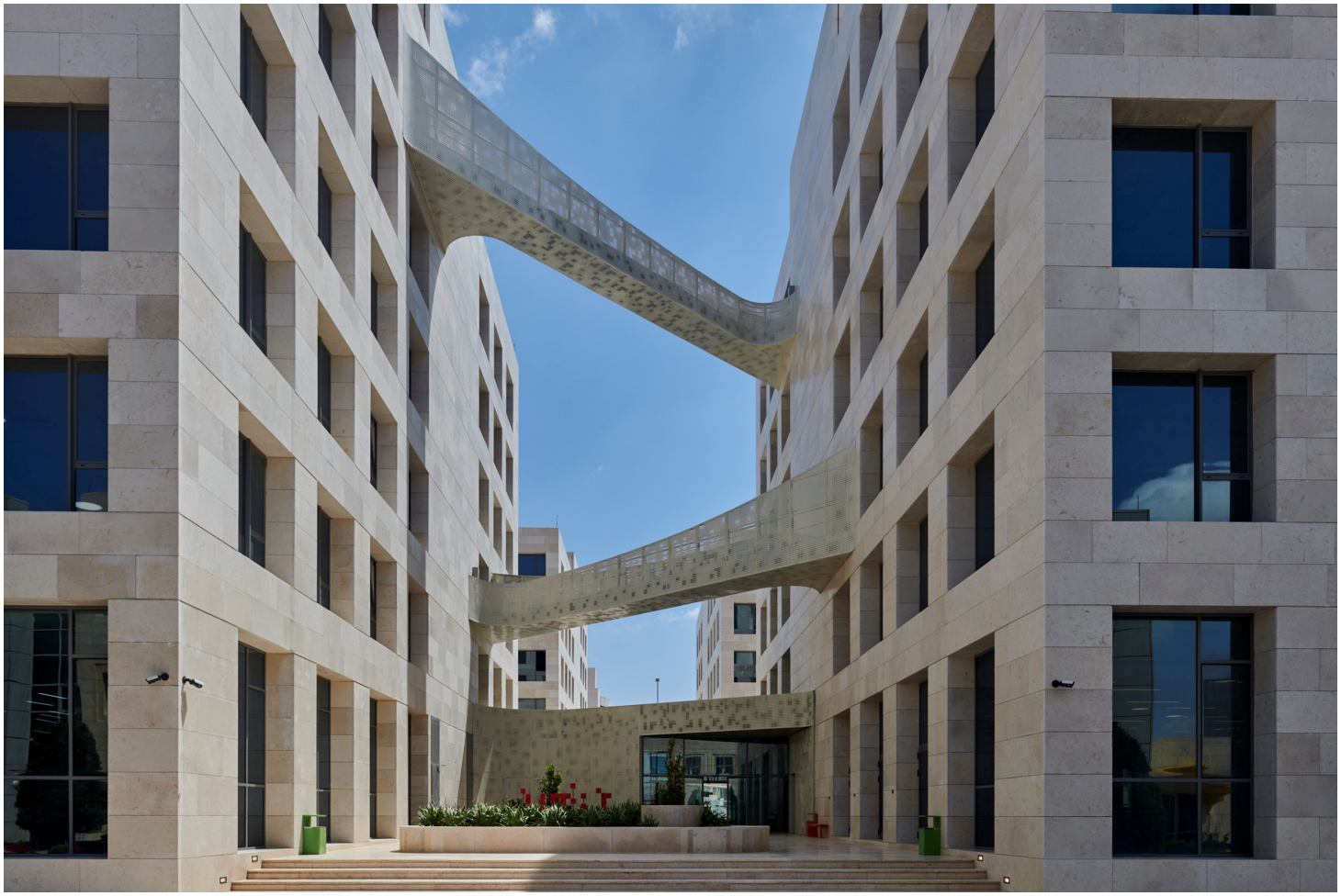
جامعة الحسين التقنية
Al Hussein Technical University

ASSIGNMENT BRIEF

HTU Course No: 40201200	**HTU Course Name:** Advanced Programming
BTEC Unit Code: T/618/4902	**BTEC UNIT Name:** Applied Programming and Design Principles



Student Name/ID Number/Section	
HTU Course Number and Title	40201200 Advanced Programming
BTEC Unit Code and Title	T/618/4902 Applied Programming and Design Principles
Academic Year	2024-2025 2
Assignment Author	Malek Allouzi
Course Tutor	Sultan Alrushdan - Malek Allouzi
Assignment Title	Car Maintenance and Repair Center Management System
Assignment Ref No	1
Issue Date	10/05/2025
Formative Assessment dates	From 16/05/2025 to 29/05/2025
Submission Date	11/06/2025
IV Name & Date	Asma'A Lafi 09/05/2025

Submission Format

The assignment consists of two parts, each with specific requirements and deadlines. All submissions must be made individually by each student.

Part 1: In-Class Assignment

Format: Closed-book examination
Date: Saturday, May 10, 2025
Time: 12:00 PM – 2:00 PM

Part 2: Take-home Assignment

The take home assignment is an individual written report in Word format (not PDF) covering all questions and a full working source code for tasks requiring code implementation, using JAVA language on any IDE.
Submission deadline: Wednesday, 11/6/2025, at 11:59 PM.

Report Requirements:

- Submit a well-formatted Word report with answers to all required tasks.
- Clearly label each answer with the question number.
- The Code should be implemented using JAVA Language.
- Submit files as a soft copy through the university's eLearning platform: https://elearning.htu.edu.jo/ by the deadline.
- **Note:** Email submissions or late submissions will not be accepted.

Academic Integrity:

- Any plagiarism will be addressed according to HTU policies and regulations.
- Failure to submit the declaration form will result in the rejection of your report.

Oral Discussion:

- An oral discussion with your instructor will be scheduled after the submission deadline.
- Attendance is mandatory, with the exact schedule to be announced.

Unit Learning Outcomes

LO1 Investigate the impact of SOLID development principles on the OOP paradigm

LO2 Design a large dataset processing application using SOLID principles and clean coding techniques

LO3 Build a data processing application based on a developed design

LO4 Perform automatic testing on a data processing application

Assignment Brief and Guidance

Car Maintenance and Repair Center Management System Assignment Scenario

A **Car Maintenance and Repair Center (CMR Center)** needs an automotive repair and maintenance services to three categories of customers:

1. **Private car owners**
2. **Fleet company clients**
3. **Center staff members**

Customers are required to **register** by providing their **full name, address, national ID number, contact number, and car details** (make, model, plate number).

Each service visit costs **50 JD**. Discounts are applied as follows:

- **Fleet clients** get a **30% discount**
- **Center staff** receive a **50% discount**

The repair center has **one service location**, so only one car can be serviced at a time, and each service session takes **1 hour**.

Staff members include:

- **Mechanic**, who performs and records repairs
- **Technician**, who assists and documents diagnostics
- **Front desk staff**, who handle registration, billing, and appointment scheduling

Working hours are from **9:00 AM to 6:00 PM**, with the **last appointment at 5:00 PM**.

The automated system must support the following features:

- **Front Desk Staff Responsibilities:**
  - Register new customers and their cars
  - Schedule a same-day service appointment (1-hour slot)
  - Calculate the service bill and print it based on national ID
  - Print all daily appointments with customer and car details
- **Mechanic Responsibilities:**
  - View list of all scheduled service appointments
  - Add service report for each appointment (repairs performed, parts used)
- **Technician Responsibilities:**
  - Add diagnostic results (issues found, recommended actions)
  - Generate a daily report in text format for each serviced car:
    - Customer national ID
    - Car plate number
    - Repair and diagnostic notes
    - Appointment time

As a junior software engineer at an automotive IT company, you were asked to develop the CMR management system by and you need to do the following tasks:

Task 1:

Design and build class diagrams for the CMR management system using a UML tool. Your design should show the class relationships, your design should apply SOLID principles, clean code.

Task 2:

Using a UML tool, refine the design that you created in **Task 1** to include at least one of each creational, structural and behavioral design patterns.

Task 3:

Design a suitable test Plan for the application, including provision functionalities to be tested and Test cases, provide at least 3 functionalities to test with 3 test cases for each.

Task 4:

Assess the use of design Patterns (Creational, Structural and Behavioral) used in your design in **Task 2**, by providing where the patterns were applied and the advantages they provide.

Task 5:

Build the application derived from UML class diagram in **Task 2. (Code)**

Note: your application should contain a main class that covers all functionalities of the system.

Task 6:

Based on your Developed Application in **Task 5**, list each SOLID principle, clean code and design pattern that you used and assess their effectiveness on your Application.

Task 7:

Implement the test plan developed in **Task 3** on the developed application in **Task 5**.

Task 8:

a. Examine the different methods of implementing automatic testing as designed in the test plan.
b. Discuss the differences between developer produced and vendor provided automatic testing tools for applications and software systems.
c. Analyze the benefits and drawbacks of different forms of automatic testing of applications and software systems, with examples from the developed system.

Learning Outcomes and Assessment Criteria			
Learning Outcome	**Pass**	**Merit**	**Distinction**
LO1 Investigate the impact of SOLID development principles on the OOP paradigm	**P1** Investigate the characteristics of the object orientated paradigm, including class relationships and SOLID principles. **P2** Explain how clean coding techniques can impact on the use of data structures and operations when writing algorithms.	**M1** Analyse, with examples, each of the creational, structural and behavioural design pattern types.	**D1** Evaluate the impact of SOLID development principles on object orientated application development.
LO2 Design a large dataset processing application using SOLID principles and clean coding techniques	**P3** Design a large data set processing application, utilising SOLID principles, clean coding techniques and a design pattern. **P4** Design a suitable testing regime for the application, including provision for automated testing.	**M2** Refine the design to include multiple design patterns.	
LO3 Build a data processing application based on a developed design	**P5** Build a large dataset processing application based on the design produced.	**M3** Assess the effectiveness of using SOLID principles, clean coding techniques and programming patterns on the application developed.	**D2** Analyse the benefits and drawbacks of different forms of automatic testing of applications and software systems, with examples from the developed application.
LO4 Perform automatic testing on a data processing application	**P6** Examine the different methods of implementing automatic testing as designed in the test plan. **P7** Implement automatic testing of the developed application.	**M4** Discuss the differences between developer produced and vendor provided automatic testing tools for applications and software systems.	