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| ASSIGNEMNT MATERIAL | | | |
| **Y/615/1651 Advanced Programming** | | |
| For use with the following qualifications:   * HTU Technical Degree in Information Sciences * HTU B.Sc. Degree in in Information Sciences * HND | | | |
| Assignment Brief Number: | | 1 | |
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| **Version** | **2** | | |



**Assessment Brief**

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| Student Name/ID Number/Section |  |
| HTU Course Number and Title | **30201200 Advanced Programming** |
| BTEC Course Number and Title | **Y/615/1651 Advanced Programming** |
| Academic Year | Spring 2021/2022 |
| Assignment Author | Hamzeh Asefan |
| Unit Tutor | Hamzeh Asefan |
| Assignment Title | **Registration and Grading System** |
| Assignment Ref No. | **No. 1** |
| Issue Date | 16/04/2022 |
| Formative Assessment Dates: | 05/05/2022 – 10/06/2022 |
| Submission Date | 20/06/2022 |
| IV Name & Date | Eng. Ashraf Al-Smadi 24/04/2022 |

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| **Submission Format** |
| Submission for this assignment is expected to be an **individual written report**. This report should be:   * In a form of a **soft copies (PDF)** submitted to the instructor (eLearning). * System source code (compressed file) that contains “src” folder. Source code should be uploaded to the university's eLearning system. * Signed Declaration form (Included). * Written in a formal business style (headings, content page, paragraphs, subsections and illustrations as appropriate, single spacing & font size 12). * Supported with research and referenced using the Harvard referencing system.   Augmented by a presentation with your assessors illustrating your assignment and answering questions (witness statement - Included).  Note: Soft copies submissions should be done through the university’s eLearning system within the deadline specified above from below link: <https://elearning.htu.edu.jo> |

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| **Unit Learning Outcomes** |
| **LO1**. Examine the key components related to the object-orientated programming paradigm, analysing design pattern types.  **LO2**. Design a series of UML class diagrams.  **LO3**. Implement code applying design patterns.  **LO4.** Investigate scenarios with respect to design patterns. |
| **Assignment Brief and Guidance** |
| **Scenario:**  You work as a software engineer in a university in Jordan. The university needs to develop a new system: Registration and Grading System. The system must apply the Object Oriented and Design Patterns concepts.  To achieve the above goals, your manager asked you to prepare a full report that contains core information starting from designing the UML Class diagrams and their relationships, then explain the Object-Oriented characteristics and design patterns. After that you should develop a running code that implements UML Class diagrams as follows:   * The university includes two schools: School of Computing and Informatics and School of Engineering Technology. * School of Computing and Informatics has three programs: Computer Science, Data Science and Cyber Security. * School of Engineering Technology has three programs: Electrical Engineering, Mechanical Engineering and Energy Engineering. * Each school has id, name and dean of the school. * Each program has id, name, credit hour fees and head of the department. * Each student must have the following attributes: id, name, school and program. * In every semester the registration department announces courses schedule. Each course can be studied through multiple sections. Each section is associated with one instructor. * Each course has the following attributes: id, name and credit hours. * Each instructor has the following attributes: id, name, school and salary. * Student and instructor might be shared with the following attributes: id, name and school. * Student can do the following actions: add course, drop course, calculate required fees and calculate semester average. * Instructor defines the weights of the exams with a maximum of 5 exams. The midterm and final exams are mandatory for all courses. for example: First exam 20%, mid exam 30% and final exam 50%. * At the end of the semester, the instructors must assign grades for their students. * The instructor converts the sum of marks from 100 into grading system: * A 90–100% * B 80–89% * C 70–79% * D 60–69% * F 0–59% * The grades should be approved by the instructor first, then the head of the department, then the dean. * Student can print his schedule in text and html format as following (can’t changing order):   + Header: report title, student name, school name, program name and current date.   + Content: course number, course name, credit hours, sum of marks and final grade.   + Footer: sum of credit hours.   **Part 1:**  **1.1** Examine the object-oriented programming characteristics (Encapsulation, polymorphism, constructor, abstraction, interface, collections, the relationship between class and objects, static keyword). Also include the information about class relationships generalisation, realization, dependency, association, aggregation, composition (**Report**).  **1.2** Determine intuition, when to use and disadvantages for the following design patterns: Prototype (Creational), Adapter (Structural), and Iterator (Behavioural) (**Report**).  **1.3** Analyse the relationship between OOP paradigm and the design patterns (**Report**).  **Part 2:**  **2.1** Design and build class diagrams for the system using a UML tool (**Report**).  **2.2** Define class diagrams for Builder and Template design patterns using a UML tool (**Report**).  **2.3** Analyse how class diagrams you drew in **2.2** can be derived from the code that you will write for the system (**Report**).  **Part 3:**  **3.1** Build an application derived from system UML class diagrams (**Code**).  **3.2** Develop code that implements Template, Chain of Responsibility, Facade and Singleton design patterns which will enhance the system (**Code**).  **3.3** Evaluate the use of design patterns used in **3.2** (**Report**).  **Part 4:**  **4.1** You are required to implement design patterns using Java technology by developing a small application. The application should present practical examples for the following patterns (**Report + Code**):   * Factory * Bridge * Proxy * Strategy   **4.2** Reconcile the most appropriate design pattern that can be used in the following scenarios (**Report)**:   * The system shall be easy adapted with any changes in business rules such as fees payment way where student can pay fees then register courses or vice versa (**Must be included in the code).** * The system uses Oracle database with following characteristics (which must be defined once for all users) **(Must be included in the code)**: * Server name: reg-db.htu.edu.jo * Port: 1521 * Database name: ORCL * Username: reg * Password: Reg#2022 * Instructor should build the exam weights object step-by-step **(Must be included in the code)**. * Creating object to connect to database is costly and take long time. You need to speed up the creating process. * In the system, you need to allow access to certain internet sites for master students and they will be blocked for bachelor students. * You have created Shape interface then you implemented it as Circle, Rectangle, Square and Triangle shapes. You want the client to create objects for all shapes without exposing the creation logic.   **4.3** Critically evaluate the use of design patterns in **4.2** (**Report**). |
| **Notes:**   * Application should contain a main class that covers all functionalities of the system. * Object Oriented principals should be applied in the system. |

Learning Outcomes and Assessment Criteria

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| Pass | Merit | Distinction |
| **LO1.** Examine the key components related to the **object orientated** programming paradigm, analysing **design pattern** types | | **D1. Analyse** the relationship between the **object-orientated** paradigm and **design patterns**. |
| P1. Examine the characteristics of the object-orientated paradigm as well as the various class relationships. | M1. Determine a design pattern from each of the creational, structural and behavioural pattern types. |
| LO2. Design a series of UML class diagrams | | **D2.** **Analyse** how class  diagrams can be derived from a given **code scenario** using a UML tool. |
| **P2.** **Design and build** class  diagrams using a UML tool. | **M2.** Define **class diagrams** for specific **design patterns** using a UML tool. |
| LO3. Implement code applying design patterns | | **D3.** Evaluate the use of design patterns for the given purpose specified in M3. |
| **P3.** **Build** an application derived from **UML class diagrams**. | M3. Develop code that implements a design pattern for a given purpose. |
| **LO4. Investigate** **scenarios** with respect to **design patterns** | | **D4 Critically** evaluate a range of **design patterns** against the range of given scenarios with **justification** of your choices. |
| **P4 Discuss a range of design patterns** with relevant examples of creational, structural and behavioral pattern types. | **M4 Reconcile** the most appropriate **design pattern** from a range with a series of given **scenarios**. |

**Student Assessment Submission and**

**Declaration**

When submitting evidence for assessment, each student must sign a declaration confirming that the work is their own.

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| **Student name:** | | **Assessor name:** | |
| **Issue date:** | **Submission date:** | | **Submitted on:** |
| **Programme:** | | | |
| **Course Name: Advanced Programming**  **HTU Course Code : 30201200 BTEC UNIT:** 6 | | | |
| Assignment number and title:  **No. 1** **Advanced** **Programming Assignment** | | | |

**Plagiarism**

Plagiarism is a particular form of cheating. Plagiarism must be avoided at all costs and students who break the rules, however innocently, may be penalized. It is your responsibility to ensure that you understand correct referencing practices. As a university level student, you are expected to use appropriate references throughout and keep carefully detailed notes of all your sources of materials for material you have used in your work, including any material downloaded from the Internet. Please consult the relevant unit lecturer or your course tutor if you need any further advice.

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| **Student declaration**  I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.  **Student signature: Date:** |