CS251: Intro to Software Engineering
Homework 3 (10 + 2 bonus marks)
Due Dates 24 April and 5 May 2023 @ 11:59 pm

Objectives

By doing this assignment, you will:
1- Learn about software design and how to move from requirements (what) to design (how).
2- Learn how to develop architecture, class, state and sequence diagrams to describe a system.
3- Learn how to transform design models to code
4- Learn how to document code by Java doc and to use GitHub as a repository for the project.

Setup

1- This assignment will be solved in **groups of 3 students from the same lab**. They do not have to be the same group who worked on Homework 2. **، تخلص من الأندال و ابحث عن الرجال** Teams of less than **ممكن يكون زميلك متوسط أو ضعيف بس المهم يكون جدع و بيجتهد و بيرد على الاتصالات** 3 people are still required to do the **whole assignment.**

2- This is a big assignment that will require each team to work together closely and independently and will need self-learning and self-discipline. هذه المسألة هى مسك الختام للمقرر وتتطلب قدرا كبيرا من التعلم الذاتى والبحث وتنظيم الوقت والتعاون الجيد مع أعضاء الفريق.

3- The group will submit together **one combined** solution.

4- The entire group is responsible of helping any weak member to be able to do his/her task **by his/herself**, by providing the necessary support, knowledge, hands-on demos, etc.

5- Only submit original work. Any copied (or AI-generated) work will be severely penalized.

6- مسؤولية الفريق تضامنية عن عمله و أى غش من أى فرد سيكون مسؤولية الجميع و يخصم منهم مثل الدرجة

7- Please read the marking criterion very carefully to understand how you will be marked.

Project Phase 2: System Design (6)

1- **Read carefully the Toffee project description** given with this assignment.

2- **Read carefully the sample SRS** given for Toffee project. These are not perfect but they give very good description of how the program should behave and look like and the user tasks performed through the program. **(I got 25 excellent SRS for Toffee. I had to select any 2 💚).**

3- **Read carefully the Software Design Specifications template** given with this assignment. Read the instructions in red very carefully. Again, read red instructions to know how to fill the form.

4- **Write the SDS document of Toffee project**, including all the required details. **Use the template attached with this homework.**

5- Upload the **draft version by 24 April 2023 as a pdf file.** Draft version should **include the architecture diagram, the class diagram and class responsibility table and 2 sequence diagrams**. File name must be *CS251-2023-SectionNumber-TA-LeaderID-DraftToffeeSDSv0.0.pdf* for example *CS251-2023-S5-AmanyAdel-20210004-DraftToffeeSDSv0.0.pdf*

6- **On 5 May 2023 load the final version. Only one member of the group** should upload the final version **as part of one zip** file that includes the code as well. Report should include all items needed in the Software Design Specification document and a **cover page with team names, IDs, emails, course name and number and document topic and title.** File name must be *CS251-2023-SectionNumber-TA-LeaderID-FinalToffeeSDSv1.0.pdf* for example *CS251-2023-S10-AmanyAdel-20210004- FinalToffeeSDSv1.0.pdf*

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Task 1: System Architecture

1- **Identify** all the main components or subsystems of the system and describe their role.
2- **Decide** the suitable architectural design for e-Commerce systems like Toffee (For example, consider a 3-tier system)
3- **Draw** an architectural diagram showing the different parts of the system using a suitable notation like C4 or arrow and box.

Task 2: Class Diagram

1- **Identify** all the important classes in the system
2- **Divide** these classes into packages or subsystems, each one includes the related classes.
3- **Decide** the responsibility of each class and what role it plays.
4- **Design the attributes and operations** of each class. For each attribute decide the type and visibility. For operations, decide the name, parameters and return type.
5- **Design the relations** between classes (inheritance, association, aggregation, composition). For each relation, decide the direction and multiplicity and give it a label.
6- **Read again,** the Software Design Specifications template given with this assignment.
7- **Finally, draw a complete class diagram** for the system, divided into packages or systems. **Use a tool for drawing.**

Task 3: Sequence Diagrams

Sequence diagrams help developers understand how a system works and how a use case is implemented using the classes and methods in the class diagram.

1- **Select** the most important **six** user stories from your SRS or the sample SRS included
2- **Implement** a detailed sequence diagram for each one of them.
3- **Read again,** the Software Design Specifications template given with this assignment.

Task 4: State Diagrams

State diagrams help developers understand the different possible states for an important object and the events that cause it to move it from a state to another.

For the order object, draw a state diagram to show the developer the different states it can be in. (for example it is initially created and waits for payment. If paid, it is ready to ship. If shipped it is closed. Think of cases of canceling, returning, cash-on-delivery, etc.)

Project Phase 3: Implementation (4)

In this phase of the project, we will implement a small part of the system's backed (or business logic) in Java / C# / Scala or Rust. The purpose is to learn transferring model to code, good quality code. **Your code must work.** Your task will be:

1- **Read** the Corona Store example in the course page.
2- **Implement** the parts of your class diagram (in the back end or business logic) related to (1) registering a user and login, (2) displaying a catalog of items loaded from somewhere, (3)

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shopping for items and adding them to cart, and (4) making an order to be paid upon delivery in cash. Closing the order when delivered. You will implement the necessary domain classes and control classes.

3- **Implement sequence diagrams** related to these functions.

4- **No need to implement UI for this task.** Write a small Main class to test these classes.

5- **Create a private repo on GitHub and use it** to develop the code **by doing multiple commits. Add snapshots of your GitHub Repo for every team member** in a pdf file with the code.

6- <u>**Zip your code**</u> with the final SDS and name the file *CS251-2023-YourGroup-TA-LeaderID-ToffeeSDS-Code.1.0.zip*

Project Phase 4 (Bonus): Documentation and Clean Code (1)

1- **Document** the all classes and functions using JavaDoc (or similar tools for other languages) and **generate documentation.**

2- **Review code quality and readability and apply** the Java Coding Style manual attached with this homework.

Individual Task: TechRadar (1)

1- **Each team member individually goes to TechRadar**
   https://www.thoughtworks.com/radar/

2- **Review the tools and technologies mentioned**

3- **Choose any technology or tool you like**

4- **Try this technology and write a 1-page review (font size 12, single-spaced) about it**

Deliver and Assessment

1- **Submission is only accepted through course page. <u>Only one team member</u>** should upload the work.

2- Name it *CS251-2023-YourGroup-TA-LeaderID-ToffeeSDS-Code.1.0.zip*

3- **You will upload one zip file containing:**
   - A pdf file containing your design (SDS) document.
   - A directory with your implementation and documentation. Add a Readme.txt file explaining the files included and the tools used to develop the program.
   - All pdf files should have a cover page with your team names, emails, phone of leader, document name, FCAI logo, course name, etc.

4- **24 April 2023. Upload draft versions of SDS including the class diagram and description of classes and their responsibility.**

5- **5 May 2023. Upload complete SDS, code and documentation.**

6- **Discussion meeting will be decided by TA. You must provide your emails and mobile number of team leader on the report cover.**

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Marking criteria

Software Design Specifications (6)

0.5 mark   Properly formatted, well organized report.
0.75 mark   For excellent well-designed and explained architecture diagram.
2.0 marks   For an excellent class diagram and class description that correctly
                      captures most of the classes, their details and their relations
2   marks   For excellent 6 sequence diagrams and class-sequence table.
0.75 mark   For an excellent state diagram for order states
-6.0   For copied or non-original report or giving yours to another group.

Implementation (4)

3.5   marks   For excellent working code that does the required functions.
0.5 mark   For organizing the code in a nice way.
-4   For copied or non-original code or giving yours to another group.
-1   Failing to use GitHub

Documentation and Clean Code (2)

1 mark   JavaDoc pages create for all classes and methods with useful info
                      Java Coding Style is accurately followed and code is readable.

Policy Regarding Plagiarism:

١. تشجع الكلية على مناقشة الأفكار و تبادل المعلومات و مناقشات الطلاب حيث يعتبر هذا جوهريا لعملية تعليمية سليمة

٢. ساعد زملاءك على قدر ما تستطيع و حل لهم مشاكلهم فى الكود و لكن تبادل الحلول غير مقبول و يعتبر غشا.

٣. أى حل يتشابه مع أى حل آخر بدرجة تقطع بأنهما منقولان من نفس المصدر سيعتبر أن صاحبيهما قد قاما بالغش.

٤. قد توجد على النت برامج مشابهة لما نكتبه هنا أى نسخ من على النت يعتبر غشا يحاسب عليه صاحبه.

٥. استعمال أدوات الذكاء الاصطناعى لعمل الحل فى هذه المسألة يعتبر غشا (تدرب على هذه الأدوات لمستقبلك لكن ليس فى هذه المسألة)

٦. إذا لم تكن متأكدا أن فعلا ما يعد غشا فلتسأل المعيد أو أستاذ المادة.

٧. فى حالة ثبوت الغش سيأخذ الطالب سالب درجة المسألة ، و فى حالة تكرار الغش سيرسب الطالب فى المقرر.