جامعة نيويورك أبوظبي
NYU | ABU DHABI

CS-UH2012

Software Engineering

Overview of Course Project

In this project, you are expected to demonstrate a solid grasp of the main software engineering principles and techniques as part of a team. You will do so by proposing, planning, designing, implementing, and testing a software system. This project will be carried out as a group effort. Note that the deadlines for all deliverables can be found in the course schedule as well as on Brightspace.

Here are some key guidelines:

1. The project will be conducted in teams, with each team comprising 4 members. Teams of 3 may be considered in exceptional cases.

2. Each team is required to select a project scope within one of the following two domains: (a) Medical, Healthcare, and Wellbeing, or (b) Sustainability (see detailed descriptions below).

3. Team formation and project selection must be finalized by Project Deliverable 1.

4. The overall project weight is 25% of the final course grade. There are five project deliverables as follows:
    a. Deliverable 1: Project proposal (2%)
    b. Deliverable 2: Requirements Document (5%)
    c. Deliverable 3: Design Document & UI Prototype (5%)
    d. Deliverable 4: Functional prototype & Testing (5%)
    e. Deliverable 5: The final implemented project code, final report, final demonstration, and final presentation (8%).

5. During the ***weeks 8 and 9*** of the term, each team should have a check-in meeting with their instructor. You are of course welcome (and encouraged!) to set up more meetings with your instructor and/or TA for more regular feedback.

6. Team Member Participation and Peer Evaluation:
    a. *Active Involvement:* Every team member is required to actively participate in all project phases.
    b. *Awareness of Contributions:* Team members must be well informed of their teammates' contributions and understand the methods employed to achieve these contributions.

c. *Peer Evaluation Form:* Each team member is responsible for completing the "Peer Evaluation Form" at the end of the project's development lifecycle (i.e., with deliverable 5). Filling this form contributes towards your grade.

d. *Feedback Impact:* The feedback gathered from these evaluations will be considered in adjusting the assigned grade for an individual team member, reflecting their specific contributions to the project. In case of an imbalance in contributions at any time during the development lifecycle (whether noticed directly by the course staff or reported by team members), instructors may require an oral assessment of a team member's understanding of the project.

7. Please follow the instructions provided for each deliverable to understand what should be submitted and where. In general, documents must be submitted on Brightspace while code and documentation must be submitted through GitHub with the repository link provided on Brightspace.

Project Domain:

Each team can choose to focus on one of the following domains: a) **Medical, Healthcare, and Wellbeing**, or b) **Sustainability**.

Project Domain (a): Medical, Healthcare, and Wellbeing

a) The field of **medical**, **healthcare**, and **wellbeing** software engineering has gained significant prominence in recent times. Substantial investments, totaling millions and even billions of dollars, have been directed towards advancing the quality of software engineering in these sectors. The primary goals of these investments are to enhance employees' efficiency, improve the overall patient experience, streamline the delivery of medical care, and promote a healthy lifestyle and improve quality of life.

Healthcare and wellbeing software development encompasses a broad range of activities aimed at addressing challenges in these interconnected sectors. These challenges include diagnostics, medical practice management, electronic health records, urgent care, hospital management, and wellness tracking. This dynamic and evolving field leverages cutting-edge approaches such as machine learning for personalized care, Big Data analytics for predictive insights, and innovative e-health solutions to empower individuals and improve overall wellbeing.

In the context of this project, you and your team members are tasked with proposing an innovative software concept within the realm of healthcare. The number of ideas in this domain are unlimited, but here are a few previously proposed examples for inspiration:

- *Unified Patient Manager:* A system that provides centralized access to patient data while maintaining stringent security measures.
- *MediFind:* An easily accessible medicine database offering comprehensive drug descriptions through QR codes.

- *Qalb+*: A platform facilitating the search for nearby healthcare providers and doctors, considering their specialties and accepted insurance types.
- *KLIK*: A web application designed to foster community engagement and alleviate loneliness among patient communities by creating support groups.

Project Domain (b): Sustainability

The field of software engineering for **sustainability** has emerged as a critical area in addressing the global challenges of environmental, social, and economic sustainability. With increasing awareness and significant investments, this domain aims to leverage technology to reduce environmental impact, optimize resource usage, and promote sustainable development practices across industries and communities.

Sustainability software development involves creating innovative solutions that address pressing challenges such as energy efficiency, carbon footprint reduction, waste management, and sustainable supply chains. This field integrates advanced techniques such as data analytics for environmental monitoring, IoT for smart energy grids, and AI for optimizing resource consumption. These solutions empower organizations and individuals to make informed decisions that align with sustainability goals.

For this project, you and your team will propose an original software concept that addresses a specific challenge within the sustainability domain. Your idea should focus on leveraging technology to create impactful and practical solutions that contribute to a more sustainable future.

You are strongly encouraged to **unleash your creativity** and **propose novel ideas** that address unmet needs or challenges in either domain. The potential for innovation is vast, and your project presents an opportunity to make a meaningful impact in these critical fields.

You are also welcome to share your initial thoughts with your professor or TA.

Please note the following when thinking of your project:

- The implemented system is required to feature both a **Graphical User Interface (GUI)**, for Mobile or Desktop, and **an implementation layer composed of Object-Oriented Classes.**
- The implemented system may be designed to integrate with other Application Programming Interfaces (APIs) or external systems / databases.
- The implemented system strictly adheres to the specified requirements and design that your team will outline throughout the project.
- You are granted the freedom to choose the technologies and programming languages for the implementation. However, we require that the software can be **automatically built and run** without the need for us to open an IDE (i.e., your system must include a build file that compiles and packages the software in a format that can be run through the command line).

Summary of the Project Deliverables

This project consists of five main deliverables, each with specific submission deadlines throughout the course. Below is a brief summary of each deliverable. Detailed instructions and templates for each will be provided separately in the course project folder.

Deliverable 1: Project Proposal (2%):

- Each team must consist of 4 members. Exceptionally, teams of 3 may be considered.
- You are required to outline the primary "business goals" and "main features" that the system must possess, along with the list of stakeholders and other relevant details. The proposal should demonstrate the project's worthiness of development.
- You will utilize the **Project Proposal** template provided with the deliverable description to draft the project proposal, and subsequently submit it through NYU Brightspace for approval.
- A single submission per group is adequate. Ensure to include the names of team members and their Net IDs in the project proposal.
- In addition to your submitted document on Brightspace, your established group must create a **PRIVATE** GitHub repository and include its URL in the proposal. You must add the course TA, as a collaborator as well as the respective professor of your registered section. Here are our GitHub usernames: *Fzeesha1* (Faisal Zeeshan), *mkassab2015* (Prof. Kassab).

Deliverable 2: Requirements Engineering (5%):

During this phase, your team is required to:

1. Create a Software Requirements Specifications (SRS) document adhering to the provided template that will be discussed during the course. This document should furnish a comprehensive description of the intended software system, encompassing both its functional and non-functional requirements.
2. The document should include UI prototypes for at least 2 key features of the system.

Furthermore, please note:

- The initial grade for Deliverable 2 will be assigned upon the submission of the first version.
- Subsequently, feedback will be provided to guide improvements.
- Your team is expected to submit Version 2 of Deliverable 2 at the culmination of the course (during the submission of Deliverable 5).
- The final grade for Deliverable 2 will be determined by calculating the average of the two versions of the submission.

Deliverable 3: Software Design (5%):

During this stage, your tasks include:

- The selection of at least 5 primary use cases to proceed with their design and UI mockups/prototypes.

In this Design stage, which is a crucial phase in your project, you will meticulously craft the foundational structure and design of the software system. This encompasses several key tasks:

- Detailed system sequence diagrams for the selected use cases.
- Domain model encompassing the concepts and associations from the selected use cases.
- Operation contracts for key operations from the selected use cases.
- Interaction diagrams for the key operations from the selected use cases.
- Detailed class diagram for the selected use cases.
- (Refined) User Interface (UI) Design Mockups or Prototypes for the selected use cases.

The successful execution of this phase sets the stage for effective implementation, ensuring that the software system meets its intended objectives and requirements while delivering a high-quality user experience.

Furthermore, please note:

- The initial grade for Deliverable 3 will be assigned upon the submission of the first version.
- Subsequently, feedback will be provided to guide improvements.
- Your team is expected to submit Version 2 of Deliverable 3 at the culmination of the course (during the submission of Deliverable 5).
- The final grade for Deliverable 3 will be determined by calculating the average of the two versions of the submission.

<u>Deliverable 4: Construction and Testing (5%):</u>

During this phase, your task is to implement and test three of the five use cases from Deliverable 3, such that you have an initial working implementation of your system. You will record a video with a demo of the three use cases you implemented.

Given the three use cases, your tasks include:

- Implementation in accordance to the devised plan and models from Deliverable 3.
- The design and implementation of a comprehensive test plan for the system.
    - Your plan should explain the testing techniques you used to select your test cases. The test cases must define clear pass/fail criteria and a traceability matrix to explain how they related to the requirements.
    - Your test implementation should be accompanied with a coverage report.
- Summarize the results of the testing according to the provided instructions/template.

<u>Deliverable 5: Final submissions, Final Presentation and Demo, and Final report (8%):</u>

At this stage, you will wrap up your project implementation, including implementing the two remaining features to create your final submission and obviously fixing any previously known issues.

Note that the presentation and demo are worth 5% of your final course grade, while the final report (including the runnable source code that we can verify) is worth 3% of your final course grade.

Presentation and Demo (in class before the final package is due).

- Each group is allocated 15 minutes for the presentation, followed by a 5-minute Q&A session.
- The presentation should:
  - explain the motivate the need for the system by clearly explaining the target problem and the stakeholders.
  - Briefly explain the system architecture using a diagram
  - Briefly summarize the technical details about the implementation and testing, including the programming languages and general technology stack used.
  - Conclude with a live demo. This part is crucial; students should be ready to demo any promised feature, as requested by the instructor on spot.
- All team members are expected to actively participate in the presentation and respond to any questions related to their project.
- The final presentations will be scheduled during week 13. The exact schedule will be communicated at least two weeks in advance.

Final Submission:

Each group is required to submit one zipped file containing:

- " Deliverable_2 - Requirements Document - Version 2", with a summary page describing updates. See Deliverable 2 for how this will affect your grade. Not submitting version 2 will result in your deliverable 2 grade being revised to 0.
- "Deliverable 3 - Software Design - Version 2". See Deliverable 3 for how this will affect your grade. Not submitting version 2 will result in your Deliverable 3 grade being revised to 0.
- A final report containing the GitHub repo link (which should include all the up-to-date source and test code that can be automatically built and run according to clear instructions in the README file) as well as an updated coverage report. An exact template with the required information will be provided.

Exact instructions are provided with every deliverable.