Group coursework worth 100% of your final mark

Software Engineering and Professional Practice and Building Usable Software
School of Computer Science, University of Birmingham, UK and Dubai

***[IMPORTANT NOTE:** All group meetings should be held virtually and following governmental guidelines. Meetings between group members **SHOULD NOT** take place face-to-face to comply with current COVID governmental restrictions]*

Submission is via Canvas and due on December 11th, 2020, 11:59 p.m. -Firm Deadline

We are seeking innovative suggestions for interactive applications of your choice that aim at providing a societal value and support during the COVID-19 period.

The scope is open and can relate to any application you can envision for managing our lives during the pandemic. *Topics may include by not limited to:*

- Support for mental health during COVID: Among the many mental health issues include but not limited to depression, low self-esteem, anxiety and panic attacks, sleep disorder, addiction, suicidal thoughts, mood fluctuation etc. Your application may target one or more audience (e.g. mental health in children, school pupils, University students, ageing population, addicts, homeless etc.).
- Support for homeless during COVID;
- Support for elevating poverty during COVID;
- Location-based services for elevating the impact of job losses and support for job seeking during COVID (e.g., matching job seekers with job providers – temporary, short-term, hourly, regional etc.);
- Support for children remote education during COVID;
- Support for those who are self-isolating during COVID (e.g. dedicated delivery service; emotional support etc.). ;
- Support for the elderly;
- Live travel guide and advice during COVID (e.g. frequent changes in travel guide and restriction for those interested in travelling and holidays);
- International crowdsourcing information system for sharing experiences, personal stories about COVID etc.;

- Crowdsourcing application for therapies and successful COVID medication;
- Virtual international advice forum for COVID;
- Ideas for apps and software for COVID and Birmingham 2020 Commonwealth games that will take place in Birmingham (i.e. What if the games will go ahead – can you think of an app that may help? In which capacity);
- New applications and ideas for test and trace.

You software solution has to deal with ONLY ONE focused topic of interest (e.g., an app to provide support for homeless; a virtual reality environment for promoting positive thinking and sharing advice during COVID; a hologram boot for confidential counselling advice for mental health etc.). The possibilities are endless and we are flexible. Your software solution may also aim at educating and engaging with the concerned individuals and/or public. Your application may wish to use AI, Big data and/or emerging technologies (e.g., virtual and augmented reality, gesture controlled interactions, holograms, and/or mobile apps among the others- as your group see it fit) for your chosen system. Please note that the University has been investing in Augmented and Virtual Reality technologies (see that Collaborative engineering lab) and you may wish to feature these in your solution.

We are open to *creative, novel ideas and useful applications of societal change and positive health impact. We give you the freedom of choice and we do trust your taste!* We hope that your innovative solution will help us showcase the University of Birmingham as a cutting-edge institution in the use of software engineering, mobile apps, data science and/or emerging technologies. We also hope to demonstrate the creativity and ability of our software engineering students to conceptualise innovative digital solutions and to demonstrate their technical skills in systematically engineering data science solutions, covering requirements, distributed architecture and design.

A. <u>Requirements Engineering(Unit 2):</u>

A1. Describe your proposed system in 600 words (or less), stating your own assumptions on the scope of the system. Be precise, concise, and creative! Note - your scope should be reasonable and interesting enough to be handled by group members. **(2 points)**

A2. State the functional and non-functional requirements of your system. Use sensible phrasing and grouping as discussed in the sessions. **(2 points)**

B. <u>Software Design with UML(Unit 3):</u>

Use UML to document the analysis and design of your system to a professional level.

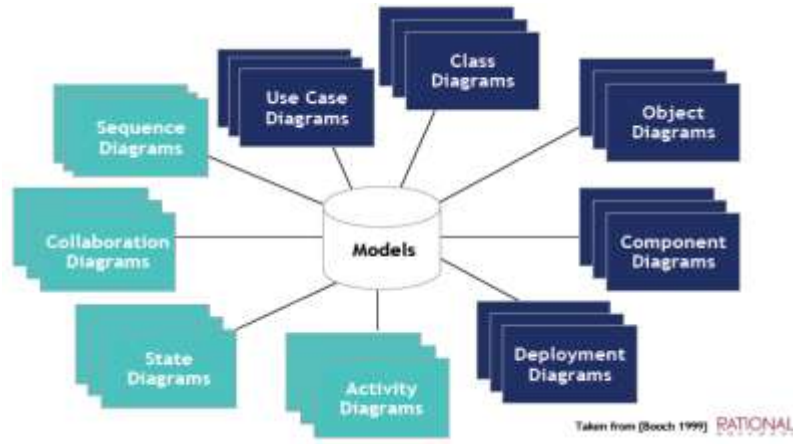

Figure 1. UML Diagrams

B1. Provide a comprehensive Use Case diagram for your system clearly indicating the actors involved. Make sure you use stereotypes such as <<extend>> and <<include>>. **(2 points)**

B2. Choose TWO non-trivial use cases from your Use Case Diagram described in B1. Document their corresponding actors. Provide meaningful documentation for the chosen two Use Cases using pre/post conditions, flow of events. **(2 Points)**

B3. Describe TWO non-trivial scenarios for each of your chosen use cases. **(2 points)**

B4. Provide an Activity Diagram for only for ONE non-trivial scenario of interest. Make sure you use forks, 4 swim lanes, and conditions. **(1 point)**

B5. Perform Class Analysis: **(2 point)**

i. Perform noun-verb analysis over your specification:

Identify the potential classes and potential operations for these classes using what discussed in Lectures. Derive your CRC (i.e., Class, Responsibility, and collaborators)

ii. Produce a First-Cut Class diagram to combine the consolidated results of using the above two techniques – i.e., noun-verb analysis and responsibility-driven analysis.

iii. Detail your Class Diagram. This should provide details on attributes, operations, relationships, visibility, multiplicity, etc) (refer to the class notes).

B6. Provide an Object Diagram for ONE non-trivial scenario of interest. **(1 point)**

B7. Provide TWO Sequence Diagrams, each describing a non-trivial scenario of interest. Make sure you use guards, envelopes, etc. State any assumption you make. **(2 points)**

B8. Provide TWO State Diagrams, each describing non-trivial scenarios of interest. Make sure you use guards, envelopes, parallel states etc. State any assumption you make. **(2 points)**

For the above questions that require modelling a non-trivial scenarios, you may model the non-trivial ones that were documented as part of the Use Case modelling and scenarios generation exercise as this can simplify your work. Please ensure consistency with your description as much as possible.

C. **Software Architecture Style, Modelling and Evaluation (Unit 3 and Unit 4):** You are now a software architect and need to adopt a sensible architecture style for your system. Your group should work on evaluating two possible architecture candidate styles for your solution. Among the numerous possible tradeoffs, you may consider security, performance, scalability, availability, safety, and/or usability etc. once you evaluate your architecture choices and decisions.

C1. Consider two possible candidate architectures styles. Provide Two Component Diagrams, each describing one of your candidate architecture styles **(2 points)**

C2. Provide Two Deployment Diagrams, each describing one candidate **(2 Points)**

Your attempt for C1 and C2 should identify the potential components. You may organise them into categories as discussed in class.

(Infrastructure, services, UI etc.); specify their interfaces; Compose the components; Model ports (if any) and subcomponents (if any).

C3. In no more than 400 words, compare and contrast your two chosen architectures and the tradeoffs. Your answer should provide a sensible conclusion on which of the two is your preferred option. **(2 Points)**

D. Software Testing (Unit 5):

Provide a testing plan of your system, covering SEVEN functional requirements and THREE non-functional. Your plan shall cover the Testing objectives, testing strategy (e.g. black box and white box); and the testing exit criteria. **(2 points)**

E. Usability and Prototyping (Unit 6):

E1. Provide an interactive prototype of your system including FIVE main screens, sketching and conceptualizing the main features of your system. You may use one of the selected tools that will be discussed and demonstrated in the class as part Unit 6; however, be free to use an alternative tools as you see it fit – we are flexible! **(2 points)**

E2. Video recording: Suppose that you have to showcase your prototype and project idea to the mass public and/or to seek funding for a startup opportunity. Provide 3-minutes video-demo of your system to showcase your system to non-experts. Use MP4 format. Be creative! **(2 Points)**

F. Ethics and Professional Practice – (Unit 8) – self-reading:
Your attempt should follow ethical and responsible design. Provide appraisal using the IEEE/ACM software engineering code of ethics. Your appraisal should not exceed 500 words. **(2 points)**

Quality, Consistency and Maturity. Follow a systematic design for all the above questions. Be consistent in using the naming across all your diagrams and their supporting documentations. Strive for a professional analysis and presentation. Make your own judgment on what to be modeled, documented, and presented **(1 point).**

Submission requirements

- The report should be typed and presented in A4 paper format. The covering page should include your group number, ID numbers, and e-mails of all members in your group.

- Your diagrams should be produced using open source UML packages or Visio. Please be free to use any UML package you are comfortable with.
- Please, do work effectively in group towards meeting the requirements of this coursework. **Meetings between group members SHOULD NOT take place face-to-face to comply with governmental restrictions and guidelines. All group meetings should be held virtually and following Governmental guidelines for COVID.**
- Please submit on Dec 11, 11:59 p.m. to Canvas. Go the "Assignment" section in the canvas module, and select the "Group CWK". Only ONE member of your group needed to submit your group report and recorded video. The system will allow you to update your submission before the deadline. The report file type is limited to doc or pdf. The recorded video must be in mp4.
- Almost all the questions of your coursework carry equal weight and computes to 33 points. For your overall mark out of 100, we will multiply your score by 3 and will add a courtesy 1 mark.
- Additional Canvas submission information and moderation would follow separately – please keep watching our announcements.
- Please keep watching the Canvas announcements for any additional feedback and organizational support that you will get as part of the coursework.

Enjoyable Coursework and Good Luck!