

# SFWRENG 3RA3

## Assignment: Software Requirement Document

## GENERAL INFORMATION

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- Start date: 02/09/2024 (00:01 AM, Toronto time)
- End date: 05/12/2024 (11:59 PM, Toronto time)
- Weight in final grade: 40%

## LEARNING OBJECTIVES

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By completing this assignment, students will:

- **Know and understand:**
  - The role of requirements in the software development lifecycle;
  - The different dimensions of requirements engineering;
  - The importance of consistency when defining requirements at scale.
- **Be able to:**
  - Write a complete requirement document from A to Z;
  - Work iteratively and incrementally on requirements;
  - Deliver a consistent set of requirements for a non-trivial case study.

## PREAMBLE

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### OVERALL DESCRIPTION

You are acting as a team of three (exceptionally two, with instructor permission) requirements engineers working for ACME Inc. (A Company that Makes Everything).

For this assignment, you will write a requirement document supporting the upcoming application development described in the Scenario document. The work is divided into two intermediate milestones and a final delivery.

### WORDS OF WISDOM

*“You should start by reading the scenario in detail. It is intentionally brief, intentionally slightly ambiguous, and is meant to give you the opportunity to try some of the techniques and methods you’ve learned in the lectures and tutorials. What matters most in doing the assignment is your explanation and justification, not whether you produce “the right answer”. As with most requirements problems, there is more than one good answer. What we are looking for is well-justified answers that at the very least correctly apply the techniques (modelling languages, tools, methods) covered in lectures.”*

– Dr. Richard Paige, Requirements Engineering Jedi Master (Fall 22)

## WINDOWS OF OPPORTUNITIES (EXTRA CREDIT)

This job is long-run and will last for the complete term. As an end-of-term deadline is far, you have two “*windows of opportunities*” to get feedback from the grading team on your work (one around each milestone). You are free to refuse these opportunities for feedback provided by the grading team and to work on your own until the end, but **we strongly encourage you to use them**.

When using a window of opportunity (delivering the current state of your document in Avenue), you’ll receive an estimation of your grade if the document stays as is in the final version, accompanied by structured feedback about improving the submitted document for the final delivery. The feedback will be written to help you bump your grade to the upper tier when relevant.

As getting feedback is a good practice, **you’ll also receive up to two bonus points** on the assignment’s final grade by adding to your final delivery an appendix (one subsection per window of opportunity you have seized) summarizing how you used the feedback to improve your document.

The maximal grade is still 100.

- Window of opportunity #1: 07/10/2024 (00:01) – 13/10/2024 (23:59)
- Window of opportunity #2: 04/11/2024 (00:01) – 10/11/2024 (23:59)

## ASK ME ANYTHING (AMA)

An *Ask Me Anything* (AMA) session will be organized on MS Teams (Channel #Customer) every week. During these sessions, a client representative will be available for one hour to answer any questions about their business and the project you are working on.

The precise schedule for such sessions will be announced on Avenue.

You can use the same channel between sessions to send textual questions to your client. **Direct messages will not be answered**, and all questions related to interactions with the client must use this public channel.

## COMMUNICATION BAN

**No questions will be answered** on the assignment during reading week or less than 72 hours before the delivery deadline.

## MSAF POLICY

- **Self-reported MSAF** does not apply to assignments that account for more than 35% of the final grade (see MSAF policy for details).
- For **admin MSAF longer than three days**, the **accommodation will be discussed on a case-by-case basis** but will assume that the student was working on the assignment regularly before their MSAF request.

## ACADEMIC INTEGRITY & GENERATIVE AI TOOLING

In addition to the academic integrity statement described in the syllabus, **students are not permitted to use generative AI for this assignment**. In alignment with [McMaster academic integrity policy](#), it “shall be an offence knowingly to ... submit academic work for assessment that was purchased or acquired from another source”. This includes work created by generative AI tools. Also stated in the policy is the following, “Contract Cheating is the act of “outsourcing of student work to third parties (Lancaster & Clarke, 2016, p. 639) with or without payment.” Using Generative AI tools is a form of contract cheating.

**Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.**



# WORKING ON THE ASSIGNMENT

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## REQUIRED SOFTWARE

- Required:
  - AsciiDoctor: To build the requirement document as a PDF.
  - Make: To automate the building
  - Git To support collaboration in an engineering context.
- Optional:
  - PlantUML: To draw UML models
  - Graphviz: To draw goal models

## DECLARING YOUR TEAM

1. Declare your group in Avenue, and check that you can access the three deposit boxes: **Opportunity #1** and **#2** (optional ones) and **Final Delivery**.
2. Accept the assignment on GitHub Classroom by clicking on the following link:
  - a. <https://classroom.github.com/a/wBwRK2NK>
  - b. **The first student creates a new team with the same name as on Avenue**, and the two others join it.
3. Clone the newly created git repository on your computer
  - a. If you need to install asciidoctor, check the installation instructions on Avenue.
4. Run the “`make check_env`” command to check that you have all the necessary software.

## WORKING ON THE DOCUMENT

Traceability is an essential dimension of requirements engineering. We’ll use git to make you accountable for your work. As such, if you’re working on a specific part of the document, we expect you to commit your work on such part under your name.

For each section, a length limit is provided. This is a hard maximum. **You must not write more and stay under this limit.** We’re looking for “neat” requirements, not fluffy text no one will ever read.

When relevant, your document should **describe** the requirements and **justify** your choices.

**Writing requirements is not a linear task.** As such, we propose a “plan” for this assignment that should be easy to follow. You are still free not to follow it and be on your own.

**Each section must have an assigned writer and a reviewer who will approve its contents.** This information must be reflected in the “control” table at the beginning of each part of the document.

## COLLABORATING EFFICIENTLY (EXTRA CREDIT)

We encourage you to organize synchronous sessions with your teammates (in-person or via video calls). You can then split the work to refine and extend the outline in parallel.

GitHub provides a **Kanban board system** that you are encouraged to use to track your progress on the different milestones. **A bonus of up to two (2) points will be given to teams** that effectively collaborate through the ticketing system (creating issues for the different tasks, commenting/reviewing through tickets, creating milestones and status trackers).

You can take inspiration from how the “ATCO Eats” document provided as reference was written:

- <https://github.com/orgs/ace-lectures/projects/8>



# FIRST MILESTONE

**(100 POINTS)**

For the first milestone, you will focus your work on (1) **understanding your customer’s needs** and (2) **capturing high-level requirements**. The content of this milestone is what will be reviewed if you decide to use the 1<sup>st</sup> Window of Opportunity.

## GOALS

- Write section G.1 “**Context and Overall Objectives**” (1 paragraph)
- Write section G.2 “**Current Situation**” (1 paragraph)
- Write section G.7 “**Stakeholders**”
  - Identify up to five direct stakeholders and two indirect ones.
  - For each stakeholder:
    - Provide a brief description (2-4 sentences)
    - Justify their relevance based on G.1 and G.2 (2-4 sentences)
  - For each direct stakeholder, complement your description:
    - Write a persona that incarnates the stakeholder (1 paragraph)
  - Identify up to three additional requirements sources
    - Provide a brief description (2 sentences)
    - Justify their relevance based on G.1 and G.2 (2 sentences)
- Write section G.3 “**Expected Benefits**” (2 paragraphs)
  - This section must include a goal model diagram.
  - This section must justify the relevance of these benefits based on G.1, G.2 and G.7
- Write section G.4 “**Functionality Overview**”
  - Identify up to five functional requirements (2 sentences/item)
  - Among these five, select two as the most important ones, and justify your choice from a business value point of view. (1 paragraph)
  - Identify up to two non-functional requirements (2 sentences/item)
  - Justify their relevance (1 paragraph)
  - Provide a RACI matrix linking them to stakeholders (1 row/requirement)

## ENVIRONMENT

- Using a bullet point list, write section E.1 “**Glossary**”
  - Identify up to five key terms, if any (1 sentence/item)
- Using a bullet point list, write section E.5 “**Effects**”
  - Identify two to three effects at max (2 sentences/item)
- Using a bullet point list, write section E.6 “**Invariants**”
  - Identify two to three invariants at max (2 sentences/item)

## PROJECT

- Write section P.6. “**Risk and Mitigation Analysis**”
  - Identify two risks related to your functional requirements. (1 paragraph/risk)
    - Your text must include a mitigation strategy
- Write section P.7. “**Requirement Process and Report**”
  - Assume that you’ll be interviewing each direct stakeholder identified in G.7.
  - Using a bullet point list, for each ones, identify:
    - The type of interview you’d be using, and its relevance (2-4 sentences)
    - The most important question to ask, and its relevance (2-4 sentences)



## SECOND MILESTONE

**(100 POINTS)**

For this second milestone, you will refine your requirements to reach the system level. The content of this milestone is what will be reviewed if you decide to use the 2<sup>nd</sup> Window of Opportunity.

### GOALS

- Write section G.5 “**High Level Usage Scenario**”
  - This section must include a Use Case diagram
  - Identify between four and six principal use cases
  - For each principal use case identified:
    - provide a 5-6 steps coarse-grained scenario (1 sentence/step)
- Using a bullet point list, write section G.6 “**Limitations & Exclusions**”
  - Identify two to three elements, if any (2-4 sentence/item)

### ENVIRONMENT

- Using a bullet point list, write section E.3 “**Constraints**”
  - Identify two to three constraints, if any (2-4 sentence/item)
- Using a bullet point list, write section E.4 “**Assumptions**”
  - Identify two to three assumptions, if any (2-4 sentence/item)
- Using a bullet point list, write section E.2 “**Components**”
  - Identify up to four external components that would interact with your system. For each component, justify their relevance (2-4 sentence/component)
- Update section E.1 “**Glossary**” with a domain model
  - This section must contain a class diagram to model your domain vocabulary

### SYSTEM

- Write section S.1 “**Components**”
  - Identify up to five business components in your system.
  - This section must contain an UML component diagram
  - Justify the relevance of the components (2-4 sentence/item)
- Write section S.3 “**Interfaces**”
  - Describe the external interfaces (APIs) offered by your components
    - This section must contain a UML class diagram
  - Provide mock-ups (low-fi wireframes) for critical parts of your system.
- Write section S.2 “**Functionality**”
  - Using the components identified in S.1 as structure and based on the high-level functionality identified in G.4, write up to four functional requirements per component, and two non-functional requirements. (1-2 sentence/item)
- Write section S.6 “**Verification and Acceptance Criteria**”
  - Describe how you’ll validate the functional requirements (1 paragraph total)
  - Defined precisely your fit criteria for the NF ones (2-4 sentences/NF req)
- Write section S.4 “**Detailed Usage Scenario**”
  - Identify the five most important scenario for your system
  - For each of these scenarios:
    - write a detailed use-case scenario using the template seen in class
    - justify why this scenario is important. (2-4 sentence)
  - For up to two scenario, illustrate your scenario with an UML Activity Diagram
    - Justify how this illustration helps to understand the scenario (2-4 sentences)



# FINAL DOCUMENT

**(100 POINTS)**

For the last leg of this race, you'll finalize your requirement document and provide an operational point of view for the project's development.

## SYSTEM

- Write section S.5 "**Prioritization**"
  - Provide a table that summarizes your requirements (S.2) and organize them according to the MoSCoW classification (1 line/requirement)
  - Describe the role of security concerns in your prioritization (1 paragraph max)
  - Justify how you performed the prioritization (1 paragraph max)
- Update section S.6 "**Verification and Acceptance Criteria**"
  - Select the most important scenario you have identified in S.4.
  - For this scenario only, propose five tests (using the formalism of your choice) that would support its validation
  - Summarize your tests and the link to the requirements by defining a traceability matrix.

## PROJECT

- Using a bullet point list, write section P.1 "**Roles and Personnel**"
  - Identify up to five roles/personels (1-2 sentence/item)
- Using a bullet point list, write section P.2 "**Imposed Technical Choices**"
  - Identify up to three imposed choices, if any (1-2 sentence/item)
- Using a bullet point list, write section P.5 "**Required Technology Element**"
  - Identify up to three elements (1-2 sentence/item)
  - If relevant, describe the impact of security concerns on these elements.
- Write section P.3 "**Schedule and Milestones**", considering that you'll have four sprints of one month each to develop the project during Q1 next year.
  - Identify the epics associated with each sprint (1 sentence/item)
  - Justify how your first sprint will lead to a *Minimal and Viable Product* (1 paragraph)
- Write section P.4 "**Tasks and Deliverables**"
  - Write the sprint backlog for your first sprint (1 sentence/story)
  - For each story, characterize its business value and a technical estimate in story points.
- Update section P.6 "**Risk and Mitigation Analysis**"
  - Identify up to two threats (1 paragraph/item)
    - Your identification must include mitigation mechanisms

## SECURITY CONSIDERATION APPENDIX

- Add an appendix entitled "**Security Considerations**" to your document
- In this appendix, create a section entitled "**Privacy-by-design**"
  - Analyze how the *Privacy-by-design* approach (a European requirement – GDPR) would make sense (or wouldn't) for this project (1 paragraph)
  - If your answer is yes, describe briefly how you'll achieve it (1 paragraph)
  - If the answer is no, describe why it is not relevant. (1 paragraph)
- In this appendix, create a section entitled "**Security Property Assessment**"
  - Briefly summarize how *Integrity* could be achieved (1 paragraph)
  - Briefly summarize how *Availability* could be achieved (1 paragraph)



## GRADING SCHEME

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If a dimension is a *Pass/Fail* (P/F), you'll be graded all-or-nothing for this dimension.

If a dimension is a *Tier* (T) one, you'll be graded using the following tiers:

- **S-Tier** (90%-100%)
  - **Exceptional quality.** *Exceptional work that demonstrates an in-depth understanding of requirements principles. Artifacts are comprehensive, well-documented, and creatively address complex situations. Critical thinking and innovative solutions are evident.*
- **A-Tier** (80%-89%)
  - **Good quality answer.** *Strong grasp of the concepts, accurately translating requirements into coherent, well-structured artifacts. Clear justifications for choices and thoughtful consideration of various perspectives.*
- **B-tier** (65%-79%)
  - **Medium quality answer.** *Satisfactory understanding of concepts, presenting functional and coherent requirements that meet the project's objectives. Reasonable effort and competency. Artifacts may lack some depth or originality but provide a reasonable foundation.*
- **C-Tier** (50%-64%)
  - **Poor quality answer.** *Basic understanding of the concepts, lacking depth or thoroughness in addressing key aspects. Artifacts may require refinement to meet stakeholder needs fully. Elements are presented but may need further development and enhancement to reach a reasonable quality threshold.*
- **F-tier** (0%-49%)
  - **No answer (or shallow/superficial contents),** *with no clear evidence of understanding for this dimension. Artifacts may be incomplete, inaccurate, or disorganized, reflecting a lack of effort or comprehension.*

***The instructor reserves the right to adapt the marking scheme (while preserving its spirit) during the marking process. Grading is global for the team, and grades will not be individualized, except if the instructor identifies blatant disbalance in the git activity.***

*If you are reading this line, send to the instructor a cat-theme meme (related to the course) as a direct message on MS Teams, along with a sentence explaining how your picture is related to 3RA3. The first five groups to do so will receive an automatic 2 points bonus on this assignment (max grade still being 100).*

Table 1. Marking scheme

Category	Dimension	Sections	Marks	Kind
Milestone #1 (/100)	Global Context	G.1, G.2	10	T
	Stakeholders	G.7	20	
	Expected Benefits	G.3	15	
	Functionality Overview	G.4	20	
	Environment	E.1, E.5, E.6	10	
	Risk and Mitigation Analysis	P.6	15	
	Requirement Process and Report	P.7	10	
Milestone #2 (/100)	High level Usage Scenario	G.5	5	T
	Contextualisation	G.6, E.3, E.4	10	
	External interactions	E.2	5	
	Domain Model	E.1	10	
	Business components & interfaces	S.1, S.3	20	
	Functionalities	S.2	20	
	Fit Criteria	S.6	10	
Final Delivery (/100)	Detailed usage scenarios	S.4	20	T
	Prioritization	S.5	15	
	Fit Criteria (traceability matrix)	S.6	15	
	Development context	P.1, P.2, P.5	10	
	Sprint planning	P.3, P.4	20	
	Threats identification	P.6	10	
	Security by obscurity assessment	Appendix	10	
Security Property assessment	Appendix	20		
General (/50)	Quality of writing	All	15	P/F
	Quality of document layout	All	10	
	Consistency of the document	All	25	

Your grade is computed as  $\text{assignment grade} / 350 * 100$ , rounded to the closest integer. Bonus points are applied to the final grade.

- Example: You have obtained 270 at the end of the term. Your final assignment grade is 77.

***We will only grade what is delivered on Avenue. No exceptions will be made.***

**Bonus opportunities:** on top of your final grade (/100), you can receive:

- Up to two (2) bonus points for having used Windows of Opportunities correctly.
- Up to two (2) bonus points for having collaborated efficiently using issues and Kanban.

**Considering the weight of this assignment in your final grade for the course, this can bump your final grade for 3RA by one letter.**

You can submit as many times as you want; only the last version will be taken into account. **It is your responsibility to deliver your work iteratively and incrementally**, ensuring that the grading team has something to grade in the end. If the delivery box is closed on Avenue, it is too late.