UNSW
AUSTRALIA

School of Computer Science and Engineering

Faculty of Engineering

The University of New South Wales

Requirements to theses submitted in the Faculty of Engineering

Thesis submitted as a requirement for the degree of

Bachelor of Engineering

Edward Webb	z5207215	Software Engineering
Allen Wu	z5205003	Software Engineering
Daniel Ferraro	z1234567	Software Engineering
Daniel Nguyen	z1234567	Bioinformatics Engineering
Emily Ngo	z1234567	Software Engineering
Rason Chia	z1234567	Software Engineering
Rebekah Chow	z1234567	Software Engineering

Abstract

More and more educational institutions depend on online learning management systems for distributing resources to students, which has been accelerated by the coronavirus pandemic, and so there are a huge number of learning management systems available. These systems have a wide variety of features such as quizzes, blogs, assessment management, integrations with third party platforms such as Zoom and TurnItIn, and more.

However, many of these systems do not have an efficient or useful way to reuse content and resources used in other courses. Time is wasted organising and uploading content for students. Many of these learning management systems are also difficult to use for both teachers and students and are missing key features such as forums and teachers may look to other platforms such as Piazza for these features in conjunction with the learning management system.

Therefore, we will implement a learning management system with an improved UI that is more accessible and easier to use for both teachers and students, and adopts a system where teachers can upload content to a specific topic. This topic then can be reused for other courses, allowing for easier course creation and management.

Acknowledgements

The authors of this thesis would like to extend their deepest gratitude to Professor Maurice Pagnucco for supervision, support and assistance to this thesis, and Dr John Shepherd for his feedback and suggestions as well.

(Expand acknowledgements in the future)

Abbreviations

BE Bachelor of Engineering

UNSW University of New South Wales

LMS Learning Management System

Contents

Chapter 1

Introduction

Having a set of clear requirements to their thesis is important to student finalising their BE, or other, degree. Such requirements are both in relation to the physical appearance of the thesis, as well as the writing style and organisation. The present document tries to concisely state the theses requirements while appearing in layout and structure as a thesis itself.

Chapter 2 explains the background for this document. Chapter 3 states the style and submission related requirements to theses submitted at the school. Chapter **??** explains content related requirements to theses. Chapter 4 evaluates the thesis requirements template. Finally, Chapter 5 draws up conclusions and suggest ways to further improve the thesis requirements template.

Chapter 2

Background

2.1 Comparison table

Categories	Canvas	WebCMS	Moodle	D2L Brightspace	OpenLearning	Edmodo	Google Classroom
Topic Tree					No		Yes
Account					Yes		Yes
Course Pages					Yes		Yes
Assignments					Yes		Yes
Dashboard					No		Yes
Quizzes/Exams/Tests/Polls					Yes		Yes
Forums					No (comments system only)		No
Multiplatform Access					Yes		Yes
Accessibility					Yes		Yes
Grading					Yes		Yes
Attendance					No		No
Calendar					Yes		Yes (Google Calendar integration)
Enrolment					Yes		Yes
Blogs/Wikis/Discussions					Yes		No
Notifications					Yes		Yes
Lectures and Tutorials					Yes		Yes
Third Party Integration					No (API is provided)		Yes
Inbox/Messaging					Yes		No
Gamification/Karma System					Yes		No
High Quality User Interface					No		Yes
Open Source					No		No
Data Migration					No		Yes
Performance (out of 10)					1		8

2.2 Google Classroom

Google Classroom is an online learning management tool provided by Google which offers a free and easy tool for helping educators manage and assess progress of students. It has become one of the most popular learning management platforms adopted in schools across Australia. The main selling points of this platform are:

- The ability to easily manage students learning
  - Allowing students join classes directly or by sharing a code or link
  - Setup a class quickly and create class work that is displayed on students' calendars
  - Providing communication with students' guardians and automatically send them updates
- The ability to easily measure students progress
  - Storing frequently used feedback to be used for fast and personalised responses
  - Allowing teachers to grade consistently and transparently with rubric integrated student work
  - Providing students with a plagiarism checker to help them produce their own original work
- The ability to provide collaboration between students and teachers
  - Connecting students and teachers online in virtual classes
  - Allowing communication of announcements on the Stream page
  - Enabling face to face connections with students using Google Meet
- Keeping data secured
  - Authenticating users through a login feature
  - Restricting classroom activities to members
  - Assuring data is never used for advertising purposes
- Allowing for third party apps to be integrated in learning for example:
  - Schoolytics: Gives educators and teachers generate insights on student learning
  - Hapara: Help students build executive functioning skills

2.2.1 Features

Google classroom provides the all of the basic functionalities and some unique features of a learning management system.

- Allows teachers to create classes/groups which students can join through a link or code
- Allows users to create announcements in which others can comment within the class
- Allows teachers to create classwork by creating questions, assignments, quizzes or class material
- Classwork can be scheduled and the due dates of the classwork will show up on students' calendars
- Classwork, posts and announcements can be reused
- Other Google applications are integrated within Google Classroom, offering more utility for all users
- Allows teachers to input grades which are viewable by students

2.2.2 Review

In terms of the aspect of ease of use, flexibility and usability Google Classroom offers teachers to reuse questions or sets of questions for classwork. Figure 2.1 highlights the functionality that allows teachers to reuse classwork. While reusing classwork teachers are able to then set separate parameters such as set the due date, add more questions, change the topic and change mark allocation.

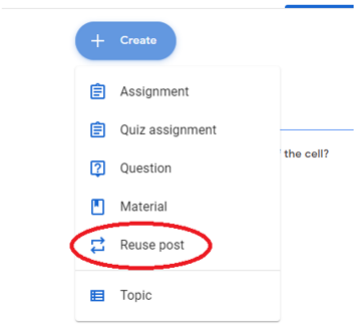

Figure 2.1: Teachers can reuse posts

Topics can also be created in Google Classroom. Topics allow for categorisation of class work. An example of the topics is shown in figure 2.2. The example displays 2 topics, each with 1 question. One functionality that is not implemented is the use of prerequisites for topics. For example, if topic1 was a prerequisite for topic2, then students who have not completed topic1 cannot access topic2. This design does not show how each topic is linked with each other which could be improved on.

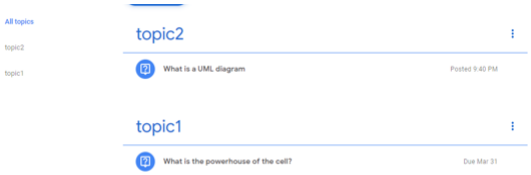

Figure 2.2: List of topics

One interesting feature within Google Classroom is the integration of other first party applications such as Google Calendar and Google Drive. Google Calendar is a very popular task reminder and calendar application and would benefit greatly with the

incorporation of displaying due dates for classwork from Google Classroom. Google Calendar allows for the easy visualisation of important dates and thus is suitable for Google classroom. Google Drive is also a very popular file hosting server where files can be easily shared with other people. For the case of Google Classroom, it can be utilised to share classwork with students.

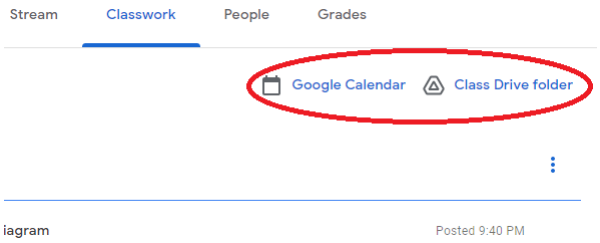

Figure 2.3: Google Drive and Google Calendars are integrated

Due to Google Classroom being affiliated with Google many of the other platforms related to Google are integrated very well. Announcements can be created which have Google Drives and YouTube videos attached which further improve the usability of Google Classroom.

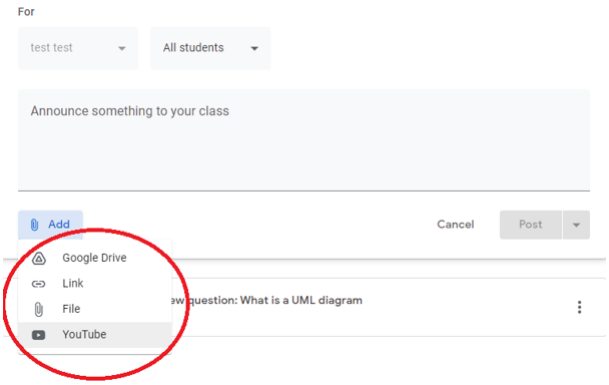

Figure 2.4: Google Drive and Youtube are integrated

Overall Google Classroom does not have many unique features that make it an outstanding learning management platform; however, it does provide the integration of other Google platforms such as Google Drive, Google Calendars and YouTube.

Chapter 3

Project Plan

3.1 Forums

3.1.1 Overview

Forums are a common feature in learning management systems as it provides a community environment where students can ask questions and discuss content with educators and other students. Many of these built-in forums, however, are very basic and lack sufficient search, sorting and filtering functionality. In many cases, educators are turning to external, third-party forums in order to take advantage of the more advanced features that they offer.

The aim of this feature is to develop a built-in forum that meets students' and educators' needs so that they no longer need to use an external application.

The forum interface consists of the overview page and the individual post pages.

Forum Overview Page

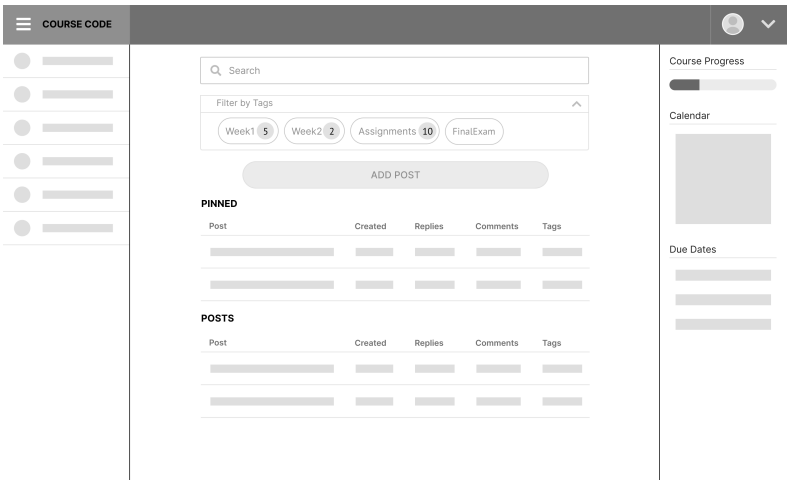

Figure 3.1: Forum overview page for a student

In general, the forum overview page consists of a list of posts, as well as search and filtering mechanisms. The collapsible filter menu allows users to filter the forum post based on pre-defined tags. Forum posts are ordered such that the list of pinned posts are at the top, followed by the remaining posts in chronological order. Each row in the table includes the post title, date created, number of replies, number of comments and the associated tags.

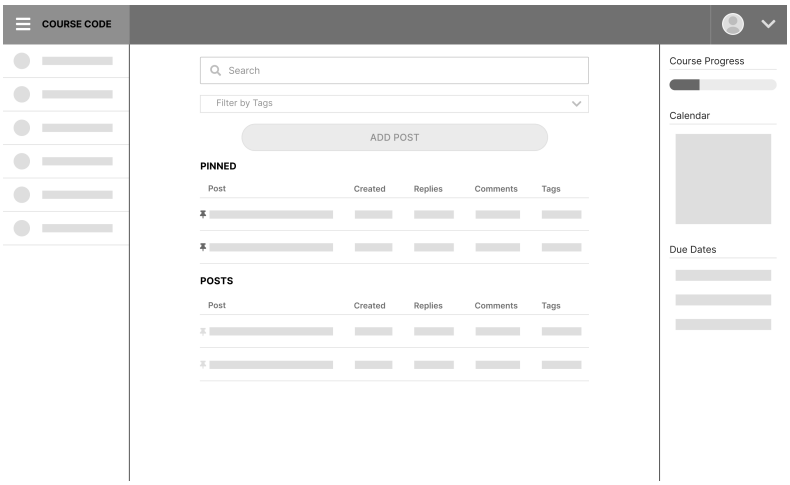

Figure 3.2: Forum overview page for an admin

Admins have an additional button that allows them to pin and unpin posts.

Post Page

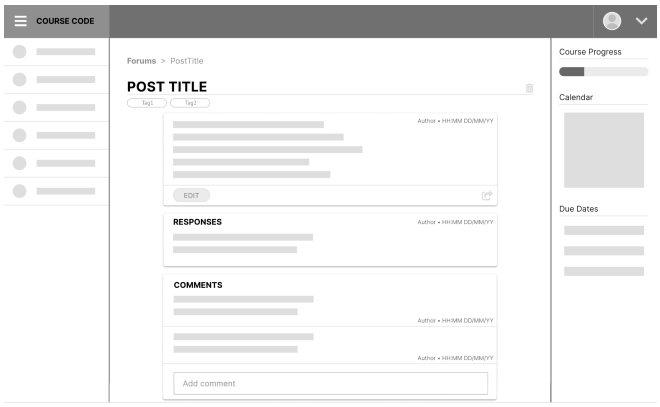

Figure 3.3: Forum post page for a student

Each forum post has its own post page which contains the post details, responses and comments. Students are able to edit their posts from the post page if required. They can easily view the instructor's response, if any, in the responses section. The comments section allows the author to view and leave any additional comments. It also gives other students a place to write a response or ask questions based on that forum post.

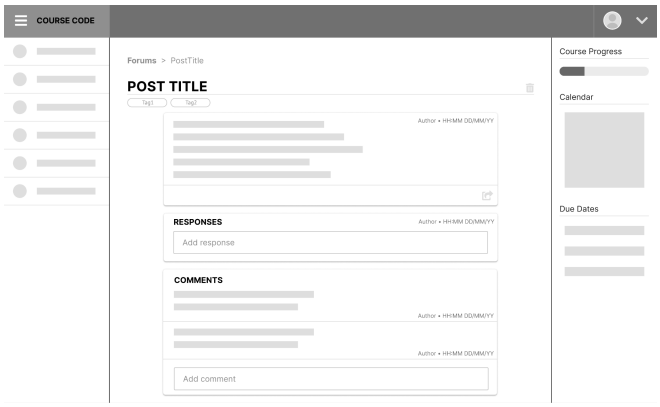

Figure 3.4: Forum post page for an admin

If a forum post is unanswered, an admin is able to leave a response. The current idea is to restrict this so that only admins can write responses to ensure that all responses are verified. It also ensures that forum posts aren't left unanswered if a student accidentally leaves a follow-up question in the responses area, instead of the comments section. This method of implementation may be reassessed if time allows.

3.1.2 Requirements

The following features are prioritised using the MoSCoW method which assists in identifying the order in which to implement the requirements. It contains the following categories

- **Must have** - vital features that are critical to the basic functionality of a project
- **Should have** - important features that aren't critical but add to the basic functionality of a project
- **Could have** - desired features that aren't necessary to the overall project but can provide a better user experience
- **Won't have** - low-priority features that likely won't be able to be completed in the given time-frame

Functional Requirements

1. Users can view a list of forum posts (Must have)
2. Users can make posts to the forum (Must have)
3. Users can reply to forum posts (Must have)
4. Users can embed images and links in their posts (Should have)
5. Users can share forum posts (Should have)
6. Users can categorise forum posts (Should have)
7. Users can search forum posts (Should have)
8. Users can clearly see which posts have been read and actioned (Could have)
9. Admins can pin important forum posts (Should have)
10. Admins can link/embed materials to forum posts (Could have)
11. Admins can curate forum questions into collections (Won't have)

3.1.3 Backend Assumptions

Since the backend for the Meta LMS is being built out independently to the individual features, the following contains a description of the ideal backend design for the forum component.

Database

The main database table required for this component is one to store all the forum posts. This would include all the post details including author, title, description, date created and tags. It would also need to have a way to keep track of the replies and comments left on the forum post. This could either be done by having separate tables for replies and comments, or by storing a list of replies and comments within each forum post entry. For each of the forum posts, the author would need to be linked to a user in the user table of the database.

API

In terms of the backend API, the following functionality would be required in order to store, retrieve and update the appropriate data from the database.

1. Retrieve a list of all forum posts
2. Retrieve a list of the pinned posts
3. Retrieve a list of posts related to search term
4. Retrieve a list of posts related to filter
5. Retrieve individual post details for post page (including comments and responses)
6. Store new post details
7. Store post responses

8. Store post comments
9. Update post details when author edits post
10. Update response when author edits response
11. Update pinned post list when admin pins/unpins posts

3.1.4 Evaluation

In order to ensure that the needs of students and educators are met for this forum component, the following evaluation methods will be used.

Functional Requirements

The first form of analysis that will be used to evaluate the forum component is to compare the completed product with the functional requirements defined during Thesis A. This will ensure that all of the essential requirements are covered. If there is enough time, it will also highlight any lower priority requirements that may be added to the component.

Usability Testing

To test the usability of the system, usability tests will be run with various students and educators. A usability test typically consists of having participants who have never used the system before run through a scenario. In this case, it may be appropriate to test that a student is able to create and view a post. Similarly, an admin might be tested to see if they can easily find an unanswered post and respond to it. Different measures like number of errors and time it takes to complete a task can be used to quantitatively assess the usability of the system. As a result, usability testing will help to identify any areas of the system that may be confusing or difficult to use.

3.1.5 Project Timeline

Below is a rough guideline of some milestones that should be met throughout the year in order to complete this feature on time.

Thesis A

The focus of Thesis A, Term 1 2021, is solely based around researching current learning management systems to get a good understanding of the desired features required for a meta LMS. It also includes more in-depth research of forums and planning out what this forum component should consist of.

Figure 3.5: Thesis A Timeline

Thesis B

Thesis B, Term 2 2021, will hopefully consist of most of the implementation work for forums. It will start with some market research to get a good understanding of the wants and needs to students and educators. Analysis of these results will help to finalise the features and designs of the forum component.

Once the frontend and backend designs have been finalised, the forum overview page and post page will be implemented. This includes viewing posts, making posts and replying to posts.

The next focus is the searching and filtering functionalities. This includes searching the forum and filtering based on pre-defined tags.

Finally, in Thesis B, the ability to pin and share posts will be added. This should conclude the implementation of all the main features of the forum component.

Figure 3.6: Thesis B Timeline

Thesis C

Thesis C, Term 3 2021, is mainly centred around finalising the implementation and evaluating the solution. The first few weeks will consist of completing any unfinished features, cleaning up the UI and debugging any problems. If there is time, extra features could be implemented. Time will also be allocated to integrating the forum with the rest of the LMS.

The middle weeks of the term will focus on analysis and usability testing. This will help see if the users' needs have been met by the implemented solution.

The final few weeks will consist of any final improvements and testing. The results from the analysis will help to fix any problems with the forum component.

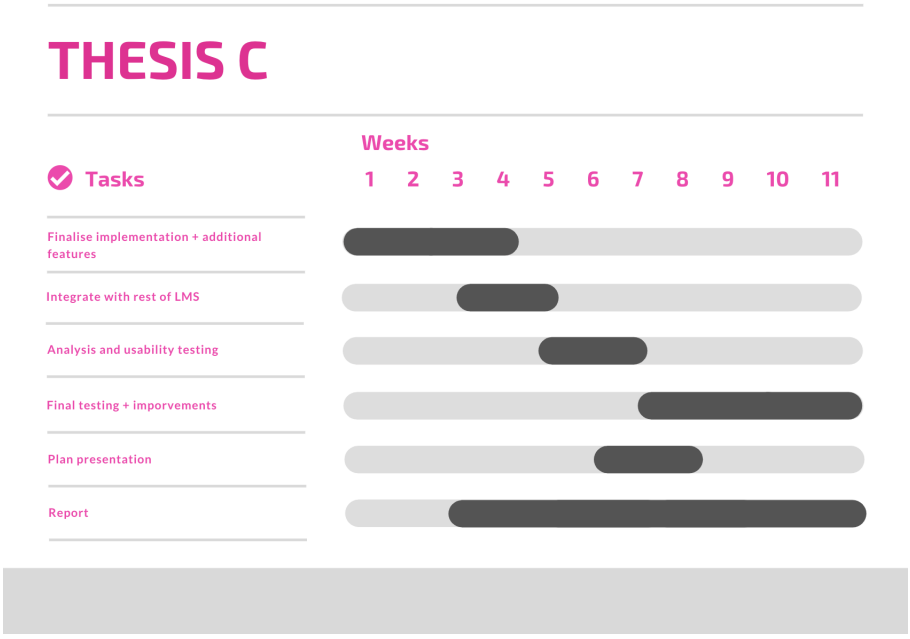

Figure 3.7: Thesis C Timeline

Chapter 4

Evaluation

This chapter is mainly provided for the purpose of showing a typical thesis structure. There are no more thesis requirements described.

4.1 Results

The result of this work is the present document, being both a LaTeX template and a thesis requirement specification.

4.2 Discussion

The Dual function of this document somewhat de-emphasises the primary purpose of the document, namely the thesis requirements. It would be better, if these could be stated on a few concise pages (cf Appendix 1, p**??**).

Chapter 5

Conclusion

A thesis requirements/template document has been created. This serves the dual purposes of giving students specific requirements to their theses — both style and content related — while providing a typical thesis structure in a LaTeX template.

5.1 Future Work

Extract the requirements from the template in order to have very concise requirements.

Bibliography