SECURE END-TO-END WEB-BASED SYSTEM FOR COURSE FILE STORAGE

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THESIS SUBMITTED IN PARTIAL FULFILLMENT FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE WITH HONOURS (NETWORK ENGINEERING)

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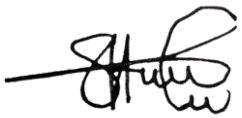
DECLARATION

I declare that this final year project report entitled "Secure End-to-End Web-Based System for Course File Storage" is the result of my own research except as cited in the references. The final year project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



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Herry Lim

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ABSTRACT

Every end of semester every lecturer required to have to prepare course file for the purpose of audit. The conventional method to store course file is not efficient and may lead to some issues like required large space to store it, document will get damaged, confidentiality issue, and hard to arranged in structured way. In this project, the objectives are to create web system for course file storage, implement hybrid encryption in the web system, and test the function of the web system using user acceptance test by getting user feedback. The methodology used in this project is agile method. The outcome of this project is web-based system to store course file.

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ABSTRAK

(SISTEM WEB BERASASKAN SECURE WEB END-TO-END UNTUK PENYIMPANAN FAIL KURSUS)

Pada setiap hujung semester setiap pensyarah diwajibkan untuk menyiapkan fail kursus untuk tujuan audit. Kaedah konvensional yang biasa digunakan untuk menyimpan fail kursus tidak efisien dan akan menyebabkan berlakunya pelbagai isu seperti memerlukan ruang yang besar untuk menyimpan fail kursus, dokumen akan mengalami kerosakan, isu tentang kesulitan dokumen, dan dokumen sukar untuk diatur dengan cara yang berstruktur. Objektif projek ini adalah mencipta sistem web untuk menyimpan fail kursus, mengimplementasikan "end-to-end" enkripsi pada sistem web, dan menguji penerimaan pengguna terhadap sistem web dengan cara mendapatkan maklum-balas daripada pengguna. Metodologi yang digunakan dalam sistem ini ialah metodologi agile. Hasil daripada projek ini ialah sistem web untuk menyimpan fail kursus.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Chapter 1 focuses on project history, problem description, aim, project scope, project schedule, report format, and summary. It uses hybrid encryption to build a secure web-based system.

The issue background focuses on project motivation. Inspiration is gained through watching the user's problem, interviewing consumers to fully grasp the challenges of users. Further study is done by reading books on managing the issue.

The problem statement covers typical methods of storing course files. The problems must be addressed, the significance of a web-based file storage system.

The project aims to create web-based system for course file storage and hybrid encryption to preserve privacy and privacy of online system data.

The goal describes the three major goals of this project. The project's goals are anticipated to be achieved by project conclusion. The project will be developed to the primary goals.

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The project's schedule addresses what should be accomplished in that particular timeframe. The project schedule is designed to organise project due dates for various tasks from project start to conclusion for two semesters.

Project organisation describes how the chapter is organised. In project organisation, each summary chapter is addressed to explain the chapter topic.

Project summary summarises project report. The summary attempts to help the reader to better grasp the report's primary point.

1.2 Project Background

To ensure the quality of education in the Institute of Higher Learning, every Institute of Higher learning must undergo the Malaysian Qualification Agency's accreditation process (MQA). To guarantee the assessment's consistency, MQA develops the Malaysian Qualifications Framework (MQF). The development of MQF will describe, systematise, unify and harmonise all qualifications in Malaysia. The code used by MQF to achieve this goal is the Code of Practice for Program Accreditation (COPPA), issued in 2008.

All Institute of Higher Learning is required to represent their course file during the audit time. Course file is needed to see whether the Institute of Higher Learning is following the standard MQA. The course file is compulsory to store for five years for each batch. The conventional method to store course files is storing them using manual record or storing it in google drive.

The conventional method of storing course files is inefficient and can lead to some issues. The issues of storing course files using a manual record are lack of storage space, security issues, prone damage, and document transportation issues (Melo, 2019). This fact is also supported by LinkedIn. LinkedIn (Breitmeyer, 2015) states that storing manual records will give more disadvantage than the advantage to the organization. Storing paper documents will be timely to keep up, especially for abundant documents. Storing manual records requires much effort when searching for specific documents, which may cause inefficient Customer Service because Customer Service takes time to respond to Customer queries.

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During the COVID – 19 pandemics, lecturers start using Google Drive to store course files. Every lecturer will create a specific file in Google Drive for each of their related course files. The issue of storing course files in Google Drive is a security issue. Another lecturer is able to access another lecturer course file. Storing course files in Google Drive can be so messy and unstructured that it makes it hard to analyse.

After realizing that issue faced by the Institute of Higher Learning on the conventional way of storing course files, the decision of creating a web-system for course file storage had been made. To understand the web-based system for course file storage, a web-based course file system from another university had been searched. However, the result from the research shows that only a few universities make their web-based system for course file storage and most universities are still using conventional methods to store course files.

Based on the fact that only a few Universities used web-based systems to store course files. The web-based system for course file system will be developed by taking inspiration from other organization web-based systems for file storage that will be customized according to Faculty of Computing and Informatics (FCI) UMS needs.

The system is developed for FCI to see the effectiveness of the system to store course files. If the solution that provides for FCI to develop a web-based system for course file storage, is effective and efficient to replace the conventional method of storing course file, the solution will be expanded to university scale. On the contrary, if there is any issue with the web-based system for course file storage, it is much easier to debug and improve, compared to starting the web-based system from the university scale.

1.3 Problem Statement

The major problem with the technique of keeping course files is that there is no customized system that has been developed, in other words, no web system that has been built to save FCI course files in an efficient and effective manner. Furthermore,

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the traditional way of keeping course files, such as hard copies or soft copies on Google Drive, would result in the following issues:

i. The issues when the course file is store in hard copy is:

- Required large space to store it (Breitmeyer, 2015)

  Every lecturer is required to keep every document related to the course file for five years.

  During this time, the record will pile up. Thus, it needed a large space to store it. In the case of FCI UMS, the course file will be stored at the faculty's quality room for around five to six year for each batch. This situation will cause the room to become crowded with an abundance of documents (Alias, 2021).

- Environmental issue due to high paper consumption (Shah et al., 2019)

  A study from the Department of Business Administration, College of Applied Sciences, Salalah, Sultanate of Oman shows that storing documents offline or manual recording has a bad impact on the environment due to high consumption of paper. This fact is supported by The World Counts (The World Counts, 2021) that the world will consume almost 120 million tons of paper in 2021, which will contribute to greenhouse gas emission.

- The course file original copy prone to lost (Moung, 2021)

  Course files need to be stored for five to six year, during this time when the hardcopy of the document is lost, the lecturer is required to provide another copy of the course file. However, the lecturer may lose the document due to laptop issues, accidently deleting the document, and forgetting where the file is stored.

ii. The issues when the course file is store in Google Drive:

- Hard to arranged in a structured way (Harkous and Aberer, 2017)

  Google Drive has no specific format to store it. Thus, every lecturer can upload every

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document in their format.

- Confidentiality issue (Harkous and Aberer, 2017)

  Confidentiality issue happens because another lecturer that not related to the subject

  can access the subject course file. Due to this issue the implementation of hybrid encryption is done to protect the access to the proposed system for course file storage.

- Version control system issue (Alias, 2021)

  The version control system happened due to a myriad of documents from the last batch, which made the lecturer confused whether the course file is the latest or it was from the old version of course file.

iii. The issues when the course file is store in Google Drive and hard copy:

- No auto-alert system (Alias, 2021)
  The conventional way of storing course files has no alert system to alert the lecturer if they have not completed the uploading of course files.

This issue can be solved by creating a web system to store course files and increase data confidentiality in the web system (Harkous and Aberer, 2017). The confidentiality criteria and techniques will be applied to the system. Static and dynamic testing also will be performed to ensure the web system confidentiality is used correctly.

1.4 Project Goal

The goal of the project is to develop a web-based system for course file storage. To secure the access of web-based systems the hybrid encryption will be implemented.

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1.5 Objectives

i. To investigate and implement end-to-end encryption to improve confidentiality of web systems for course file storage.
ii. To design and develop a web system for course file preparation.
iii. To evaluate the proposed web system in terms of its function's performance by testing the user acceptance from user feedback.

1.6 Project Scope

The project's scope is to create a web system for course file storage for FCI and apply a cybersecurity method based on Cybersecurity Malaysia guidelines (Cybersecurity Malaysia, 2019) focusing on confidentiality on the web system by implementing hybrid encryption. The primary user of this web system is lecturer, head of the program, the quality panel, dean or deputy dean, and assistant registrar as the admin. In this system admin was held by the assistant registrar because the assistant registrar has the data about the list of lecturers, subject and position that they hold. The lecturer will be assigned as a lecturer. If the lecturer holds more than one position, they assign to both positions that they hold. Take an example. If the lecturer is also head of the program, the lecturer will have two accounts as lecturer and director of the program. Every semester, every lecturer must prepare a course file for each subject they are taught at the end of the semester. The course file will be reviewed by the head of the program, and if there is a problem with the document, submit it if the lecturer requests an update. Then, the document will be forwarded to the quality panel for further review, and lastly to the dean/deputy dean for approval. Each module of the web system is explained in Table 1.6.

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Table 1.6 : Web System Module and Function

Module	Description	User
Account Management	• Manage the users account according to their position, and subject teach. • Update, Delete, Add user. • Assign email and password that need to be changed later for the new user.	Admin (Assistant Registrar)
Folder Management	• Create a submission folder for each batch of course files. • Assign each subject submission folder to the specific lecturer who teaches that subject.	Admin
Login, Logout, Authentication	• The login process required users to enter their email using their official UMS email, password, and position. For the first time user, the user is required to use email and password that they have already assigned to them. • All the lecturers will be assigned as a lecturer. If the lecturer holds more than one position, the lecturer has more than one separated account according to their position. Take an example if the lecturer also holds the position as head of the program. Then, the lecturer will be assigned to two	

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	different accounts, lecturer and head of program. ● All the users must log in using UMS email. Email from another domain will be rejected. ● The login authentication will be authenticating if the user enters the email in the correct format. The correct format of email will allow the user to login. After the login is submitted, the login will be authenticated if the user enters an UMS email.	Lecturer, Head of Program, The Quality Panels, Dean / Deputy Dean, and Admin.
User Dashboard: Lecturer Dashboard, Head of Program Dashboard, The Quality Panel Dashboard, Dean/Deputy Dean Dashboard, and Admin Dashboard	● After login each user will go to the specific dashboard according to their position. ● In the lecturer dashboard, it contains a specific folder about the subject that is taught by the lecturer. In this folder the lecturer is required to upload every document related to the course file. After the lecturer finishes uploading all the documents, they can submit it to the Head of Program. ● In the Head of Program dashboard, it contains all the documents that are submitted by the lecturer. The Head of Program is required to check it before sending it to the Quality Panel. If there is any issue with the document the Head of program can reject the	Lecturer, Head of Program, The Quality Panels, Dean/ Deputy Dean, and Admin.

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	document and request a new document upload from the lecturer. ● The Quality Panel dashboard contains the documents that have been checked by the Head of Program. In this dashboard the Quality Panel is required to review the document that is sent by the Head of Program before they send it to the Dean/Deputy dean for approval. ● In the Dean / Deputy Dean dashboard, it contains the documents that have been checked by the Quality Panel. In this dashboard Dean / Deputy Dean is required to check documents that have been sent and do the document approval. ● In the Admin dashboard, it contains account management, folder management , and progress monitoring the Lecturer, Head of Program, Quality Panels, and Dean / Deputy work. The progress monitor will monitor if all the documents have been uploaded or checked. Progress monitoring will be able to show which users have not completed their work by showing it in which part the document is pending. When the due date is under the corner and Admin finds out that some user has not completed their work, Admin can notify	

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	the user through the Notification feature. When the uploading and document checking is finished, the progress monitor will give an alert "Complete". The finished document will be stored in this Admin dashboard.	
File Management	• In every folder, it contains a file that requires the lecturer to upload a specific file. The file is arranged by the contain requirement of the file, and colour tags. • In this file management, it has a file viewer feature that allows the user to view files directly from the web. • Each file required the lecturer to upload is related, any file that has not been filled with a document will have an alert "Not Complete", and if the document has been completed the alert will be changed to "Complete". • Lecturers only can submit the folder when all the document has been uploaded, if any of the incomplete lecturers are not allowed to send the folder.	Lecturer, Head of Program, The Quality Panels, Dean / Deputy Dean, and Admin
Hybrid encryption	This module runs in the backend, to protect the web system access from unauthorised users.	Lecturer, Head of Program, The Quality Panels, Dean / Deputy Dean, and Admin

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