ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

Department of Computer Science and Engineering

COURSE NAME: FUNDAMENTAL OF SOFTWARE ENGINEERING

COURSE CODE: CSE 3212

CSE Department Resource Management System

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Chapter one

1.1. Introduction

A complete college experience can't be contained in just a classroom. It's so much more. Every campus provides a wide range of courses, projects and challenges that shape every aspect of an academic life. Many resources are available for students to connect with the programs and activities – from publications and online resources to professionals offering academic advice, counseling and other helpful services. Yet these resources may not be properly distributed and reaching to the students. Thus, Academic resource is a very essential aspect of a university study; it encompasses each and every information, document, tool, media, or resource that assists the student in succeeding in their study. A university student would mainly be concerned with gathering of academic resources for each course that he/she takes and the resource's authenticity.

A resource management system in our case referring to academic resources means the efficient and effective analysis, organization and distribution of materials such as books, references, tutorials, assignments, projects, thesis and other media that are directly an input to the course.

1.2. Background

Computer science and engineering (CSE) is an academic program at some universities that integrates the fields of computer engineering and computer science. It is a sub-field of electronics engineering, covering only the digital aspects of electronics engineering, specializing in hardware-systems areas like computer architecture, processor design, high-performance computing, parallel processing, computer networks and embedded systems. CSE programs also include core subjects of computer science such as operating systems, theory of computation, design and analysis of algorithms, data structures and database systems. The program aims at designing, developing and troubleshooting computing devices (such as personal computers, supercomputers, robots, smartphones, networking devices, embedded devices), focusing the underlying fundamental issues (like processor architecture design, operating system design, memory management, digital system design, communication protocol design, software development and database management) in the most efficient and effective way.

Computer science programs typically centers primarily around theory and software, with only some hardware; upper division courses tend to allow a lot of freedom to specialize in software and theory related areas

(e.g. algorithms, artificialintelligence, cryptography/security, graphics/visualization, numerical a nd symbolic computing, operating systems/distributed processing, software engineering).

Computer Science and Engineering integrates all of the above and is intended to develop a solid understanding of the entire machine (computer hardware and software). The higher unit count required to complete the program often means that a CSE student will need to spend an extra year in university.

Here at Adama Science and Technology University, the CSE Department is comprised of the above aspects and the resources that will be required for the project would be concerned with the above areas and fields.

1.3. Statement of the Problem

Students without the proper materials to follow up on their studies would face rigorous challenges which will lead up to lower grades, uninitiated feeling towards education, academic failure and loss of working force.

The existing system could be called somewhat of rudimentary; it has no standard function or system, it is uncharacteristically out of order. The instructors would face difficulties to give the materials they intend to use for the courses they teach to the students since it is through third party: the class representative, or it is through email distribution which is time wasting

- ✓ Lack of proper materials to read and refer
- ✓ Lack of latest and up to date resources
- ✓ Inauthentic materials may be distributed.
- ✓ It takes excessive time to find the appropriate material on the web, it might not also be found without pirated content access.

Therefore, This CSE Academic resource management system would be able to overcome the above problems by providing a genuine, standard, current materials that would assist the student in daily study and project research.

1.4. Purpose of the project

- ✓ From individual perspective
  - Help many pupil by providing them with the necessary tools and materials to succeed in their higher education.
  - It would be a standard and organized document repository for the student which would be accessible at any moment and place which is how modern education should be.
- ✓ From The University's perspective
  - The system brings a standard and a structured construct in the course material distribution and enhancing a more student-centered curriculum
  - It would put the instructors mind at ease knowing the students have the appropriate course materials necessary for their studies.

1.5. Team composition

Name	Major Responsibility	Activities	Other
Arefat Hyeredin	Team Leader	Coordinate and lead the Members, Design , Architecture, Development implementation and Documentation	Participate in all activity

Gizealew Endeshaw	Data Gathering	Requirement Analysis, Design, implementation and Documentation	Participate in all activity
Girum Getachew	Data Analysis	Requirement Analysis, Design, Data Gathering, implementation and Documentation	Participate in all activity
Biniyam Gossaye	Data Organization	Requirement Analysis, Design, Architecture, implementation and Documentation	Participate in all activity
Aberham Bekele	Photo and Graphics	Requirement Analysis, Design, Photo and Graphics, Documentation	Participate in all activity

Table 1-0-1 Team composition

1.6. Objectives of the project

1.6.1. General Objective

The general objective of this project is to design and develop an interactive web-based software that consists of academic materials following the curriculums of the computer science and engineering department at Adama Science and Technology University that would provide an invaluable assistance to the student. It is also aimed to create a very subtle and meaningful learning experience by equipping the student body with the proper resources with a more favorable and accessible condition.

1.6.2. Specific Objectives

In order to achieve the general objective, we have to surpass the following:

- Study the problem of the given problem from different prspectives.
- Gather any data and information that would be an input to the project like current system analysis (drawback), analyze resolution methods.
- Gather the resources that the system utilizes once it is in effect.
- Analyze, Organize and Discuss on the collected information and resources.
- Decide on a general direction and principle to follow throughout the analysis, design and development phase.
- Set up deadlines and milestones that would serve as a checkpoint of progress.
- Implement the system based on the proposed design and architecture.
- Develop prototypes as early as possible and then improve accordingly on the upcoming versions.
- Test each prototype version rigorously and arrive at a stable working software version.

1.7. Feasibility study

Feasibility study is essential to evaluate the cost and benefits of the new system. On the basis of the feasibility study decision is taken on whether to proceed or to cancel the project. It includes the following.

1.7.1. Technical feasibility

The team members expect the system to be technically feasible. The system would be developed using object oriented programming method. The team is not officially taught about web page programming, android application development; yet using tutorials from the web and an extensive training; the team would try to design and develop the system as much as possible with the help of the department's resources. The participants of the project also tried to strengthen the project using Python, MySQL, JavaScript, PHP MyAdmin, CSS, Enterprise Architect, EDraw Max, and Node JS in order to bring out the technical feasibility of the project as well as to utilize any open source development methods.

1.7.2. Operational feasibility

The team has performed a simple research into what the users in this case the students want and that research yielded some major points that must be included in the system. And as the system officially starts its service; it would be very helpful to the students. As the daily operations of the system commence, there would be new perspective input and feedback that would make it more operationally feasible. It would be an expensive task once the system is up and running to monitor and maintain optimal state as it would take an administrator a fulltime monitor and high cost.

1.7.3. Economic feasibility

The system as a product could be outfitted into some relating venture that would result in an economic flow yet as a proprietary system; it provides a free material to the students as it always should be in every educational venture. With some kind of agreement with the CSE Department, the system could be outfitted into the university's e-learning system which would result in economic income to the developers.

Although, if necessary the system could also contain a featured premium content (like purchasable tutorials, rare and new books) that can be sold through some online payment service which would result in fulfilling its economic feasibility.

1.8. Scope and limitation

1.8.1 Scope

- Provide the right educational resources to the student in accordance to the current curriculum
- Provide a more general and organized repository system for the resources
- Give the above services through a mobile app for a better reaching experience
- Notify the users with updates of new material and recommend strategic study plans for examinations.(optional)

1.8.2 Limitation

- The system in its early stages would only feature resources of the CSE Department.
- The students would have to have internet connection to download the materials for the first time to own it.
- Due to the FTP system, the site would have to be taken down while adding, deleting and editing the contents.
- This project might not include all the intended features because of time and other constraints.

1.9. Significance of the project

Significances of this academic resource management system are:

a) Student's perspective
   - Provide the educational materials to the students in a simple manner.
   - Minimizing the time that a new material reaches the students.
   - Provide notification when a new material is uploaded through email and through the app.
   - Ensure that the student gets genuine material authenticated by the department.
   - Minimizing the difficulty that is faced by the students to get the materials and the class representatives to distribute the materials.
   - Since the students are engaged with the system, it would help them through their studies, researches and examinations.

b) Instructor's perspective
   - Save time that would have been lost in delivering the materials without the system.
   - Contact an entire section of students regarding classes and materials in smooth and timely manner.
   - Knowing that the proper material has reached students would provide them some degree of comfort.

c) Department's perspective
   - Help manage every resource's status, record, handling and organization.
   - Saves time as students and instructors communicate and share resources very easily
   - It could be used to promote the university's any other featured contents and occasional events.
   - Minimizing workloads of the department to distribute material every time it is needed.

1.10. Methodology

We have decided to utilize the Rapid Application Model (RAD) software development model as it best fits our project idea and parameters as to fulfill the short time frame and its low technical risk. The model would enforce us to use scaffolding tool that would necessarily assist us on the development of the system. It also is an advantage since we are part of the user; it would help us maintain a full perspective on the matter. Also promotes the teams to meet several days in a week to discuss progress, identify problems and plan the day's activities with the goal being able to produce working software as quickly as possible.

Following rapid application model, multiple deliverables are produced and also revised again and again as the prototype's version increases. Each prototype would introduce or omit a certain feature based on result from the testing phase. The end-users and clients in this case the students and the department must be involved throughout the analysis, design, development as well as the testing phases as RAD would demand close relationship among them for maximum productivity and satisfaction.

1.10.1. Interviewing and Data Gathering

We have interviewed some CSE Department faculty members and students to build up a complete picture of the system requirement. And the information gathered from the interviews is summarized as follows:

Department staff especially instructors have informed us that the resources are not organized in such a way that it is accessible and provided us with the entire course list and some major materials. The inconvenience, wasted time and effort was also discussed as an issue in this situation.

Senior CSE students at Adama Science and Technology University that we interviewed about the resource management have explained to us about the challenges they faced throughout the years regarding education materials. They also provided us with some educational materials that they accumulated over the years.

A project adviser has explained to us how each process and task is done throughout the development process and he supplied with some software materials that would help us with the project.

1.10.2. Practical observation

We have laid out the major requirement from the students; what they would need to find there, what they expect to find there, and what the instructors and the department needs the students to have.

1.11 Development tools

The tools that are used (being used) consist of different soft wares and programs.

Activities	Tools/ Programs	Purpose
Client side coding	Android java programming, HTML, CSS, JavaScript, PHP	Programming Languages used to develop the mobile application and for the landing page that is used to download the app, a resource providing page with downloading features.

Platform	WINDOW 8 and 10, Kali Linux 2018	Operating systems used as an environment while in development of the system
Database server	SQLite, pHp MyAdmin, Cloud Storages	We Use to manage and Store our Data
Diagram tools	Enterprise Architect ,Visual Paradigm, EDraw Max	To develop UML diagram of the project
Browsers	All Internet Browsers	Browser is used to display web application via internet. Example Mozilla Firefox, Google chrome, internet explorer etc…..
Editors	Macromedia Dreamweaver, Bracket, Atom, Notepad++,Visual Studio, Android Studio	Editor software used to program web interface and the android app
Documentation	Microsoft Office Word 2016	Application software we used to Document our project.
Group working platform	Github , Slack	It provides to interactively and collaboratively work on the project with perks of version control and media sharing.

Table 1-0-2 Development tools

1.12. Testing procedure

1.12.1 Requirement testing

In this phase we have focused on requirement approach in which we deduced what the contents are, what the structure should be and how the data should be organized. It includes functional tests and also non-functional attributes such as system performance, system security and storage.

1.12.2 Unit testing

We have tried out unit testing phase by starting out a free domain and web hosting for the webpage as well as an FTP tool that would maintain a secure portal for webpage file manager; we have found a free domain of a (.tk, .ga) and a free hosting from awardspace with filezilla and cspan as file transfer tool for the web page. As we are at the early stages of the android app, there are only a few parameters that are built, that would be discussed on the coming chapters.

1.12.3 Integration testing

Integration testing will be commenced as the web page design is complete and some sample requirements are met. In which the website is live for a trial run and also by outfitting that same website into an android application.

1.13 Overview of Project Phases

The typical software project includes the following phases:

- Requirements Analysis and Definition (System Overview): This phase begins with analyzing what exactly the system has to do. The system overview helps see the big picture of the project and understand which steps need to be carried out. The product of this stage is the general system requirements. This document will be modified as the project is undertaken.

- Functional Specification and UI Prototype: A functional specification determines what exactly the target system must do and the premises for its implementation. All requirements should be thoroughly defined and documented. The general system requirements and other documents created in the first phase serve as input here. Depending on the nature of the system, creating a UI prototype in this phase may be crucially important for the success of the project.

- Software Architecture and Test Plan: In this phase, it is necessary to determine the system components covering your requirements and the way these components will work together.

- Implementation (Coding) and Testing: The goal of this phase is building the target system based on the specifications developed in the previous phases. Transferring the specification algorithms into a programming language

- Release and Installation: after the development and testing process is completed the software will be released

- Operation and Maintenance: The task of this phase is the proper functioning of the software. To improve a product or system, it should be continuously maintained. Software maintenance involves detecting and correcting errors, as well as extending and improving the software itself.

Cost analysis

One particular instructor would distribute resource through the class representative or to individual group or students which would optimally take 8-12 hours for complete circulation of the resource. This time could be valued into 200 to 350 ETB for a standard technical work hour payment. This project plans to minimize that time to 2-4 hours for a certain resource complete circulation; saving hundreds of birrs per day and thousands per year. Not only time is saved, for any particular resource to remain accessible on any given time and place since it is web-based system, it would make its value very expensive.

Cost Analysis and Scheduling is still under discussion.

Chapter Two

2. Description of the existing system

Currently the department of computer science and engineering at Adama Science and Technology University does not possess any academic resource management system rather there is a manual or interpersonal system to manage academic resources throughout the department. The system being developed in this case aims to computerize the existing system by building a web-based academic resource management system.

Relating Systems

The Computer Science and Engineering (CSE) Department at Adama Science and Technology University currently does not have any resource management system, rather there is an android application named EEC for the entire electrical school, as CSE department is one of the three department which is under the School of Electrical Engineering and Computing; there are curriculum and course description on the application. So there is no existing system that can be considered closely as an existing system.

There is a website and android application developed at Addis Ababa University, institute of Technology by a team of Computer Science students which would relate to the system being developed here. The website: https://www.aaupush.com/ and the android application AAUPush which work as a communication system between students and teachers by making announcements and certain educational materials to be available to the students. What this system is trying to do is to bring a more structural, organized, featured format to a system providing academic resources in a more permanent manner.

2.1. Major Function of Existing System

As there is no working existing system to the CSE Department Resource Management System, closely related systems are analyzed as follows:

2.1.1. Analysis of Relating Systems

A. App Name: EEC

App Developer: Askual Technologies

Major Functions: It is to provide the following services-

1. Curriculum
2. Class schedule
3. Curriculum
4. Courses
5. GPA calculator
6. CGPA calculator
7. Dormitory
8. Rules and regulation
9. Calendar
10. Essential phone number

B. App Name: AAUPush
App Developer: The PUSH Team
App Description by Developer: AAU Push fills the communication gap between students and teachers. Teachers simply post announcements and upload course textbooks, references and assignments for students. Students get it through website and the Android application.

Major Functions:

- The system has both website features and android application; which offer services like announcements from course instructors about recent changes and activities.
- The system also provides course textbooks, references and assignments for the students that is available on the website and android application.

2.2. Users of current system

Both systems mentioned above EEC and AAUPush have users with different needs and intentions.

- Student body
  - Students of the Department or School use it to keep in touch with their teachers.
  - Students of the Department or School would find and use materials.
  - Researching Students would use it as a reference and starting point.
  - Students can view and find information about courses being taken and ones for the future.
  - Students would save time and resources.
- Faculty Staff
  - The instructors would use the system to forward materials and announcements.
  - The instructors have a simpler delivery mechanism for assignments and references.
  - Instructors would save time and resources.
- School / Department
  - The school would have a standard course and curriculum overview available and ready.
  - The department can observe and assess materials, interactions and status of resource flow.

2.3. Drawback of current system

The current system have the following drawbacks:

- Students
  - Have no access to look any of course materials which they will learn in future when using EEC.
  - Have no access to get future course out line to be ready for course depending on it when using EEC.
  - Have no access to tutorial videos which is related to lectures or they may not be suggested to websites related to education when using both EEC and AAUPush.
  - Have no access of purchasable books or featured materials.
  - Have no access to projects and assignments previously done to be used as a reference.

As we know here in ASTU especially in CSE department, all education related files are transferred between individuals, class representatives and instructors. There is no one common source for all student to get materials from, so there may be various, different and inauthentic materials distributed between individuals which would lead them to get different insight and approach while getting ready for tests, assignments, quizzes etc. Teachers also face problems while distributing materials to students who want lecture notes or some other materials using USB Drives. Some students might try giving a USB Disk which is infected with virus to hack or steal tests from teachers.

2.4. Business rule

People use the terms "business rule" and "business logic" to refer to the portion of your application that is specific to your application and represents the core behavior of how things are supposed to work as opposed to generic functionality that could be useful in software written for a different client/business/customer base or code that exists to support the infrastructure of the application.

Although the term seems to imply otherwise, non-business software also has business logic. For example, a rule that states that "when a user does xyz, the application should validate something" can be classified as a business rule.

It's kind of a nebulous term and could mean different things to different people in different contexts. It's not worth getting hung up on. The general idea is to separate your application into logical portions, each of which is responsible for something specific.

1. The System Administrator is the only one with complete access to the backend of the website; including the roles to manipulate, takedown or launch the website.
2. The System Administrator and Instructors have to authenticate in to the system with a layer of security with Username and Password.
3. The resources or materials have to be stored into the cloud storage prior to the launch of the website.
4. Instructors have a specified access based on the course they teach to access and manipulate materials only of their boundary.
5. The user must be equipped with a viable internet connection and a viable device with an internet browser to access the website.
6. The users should be able to understand English Language to successfully navigate through the website since it is presented with English Language.
7. The system must be updated or synchronized with the resources database regularly to achieve a stable and operational web environment.

Chapter 3

3. Proposed System

3.1. Proposed system (Overall description of the proposed system)

The proposed system aims to develop a website and also an android application that provides students of Adama Science and Technology University –Computer Science and Engineering Department Students (or any other Student interested in CSE materials) a standardized, curricular and up-to-date academic materials that are gathered from instructors, students and SIG members primarily stored in Cloud Storage. Both the Website and Android Application fetch the materials from the cloud storage meaning both systems need an internet connection and (the right API level and Android version for the application).The proposed system would be advantageous in terms of time saving, providing accurate information and materials, assisting educational career with the right tools.

This chapter portrays the projects from aspects of Requirement Engineering, Architecture of solution including general architecture, requirement elicitation and specification, components diagram, class diagram, data model and functionality of requirements.

3.2. Functional requirement

After exploring the basic requirements and possible scenarios, we mentioned the functionalities in different priorities. The priorities are given according to the importance of functions for the resource management system. For example, the function of materials being available for download is of the highest priority. Generally, a resource management system should have the fundamental functions like: Viewing Materials, Provide a way to access those materials, Provide description about the materials. In this case, the system being Academic one; the materials could be course textbooks, presentations, projects, software or tutorials. In a more engaging and attractive manner, the website can provide featured contents of the department, Department announcements, Events, Reviews and Feedback option. The implementation of these functionalities would be achieved through HTML5, CSS, JS, JQUERY some others. The Android application is a tentative side project which would depend on the successful launch of the website yet, it would be met with the advances of Android platform with certain tweaks.

Functional Requirements

1. View courses with description.
2. View course materials and projects.
3. Download materials either separately or in bulk.
4. Show list of software.
5. Show list of tutorials.
6. Download software and tutorial resource.
7. Login to the system.
8. Register instructors.

9. Add, Update and Delete course materials (CRUD).
10. Add, Update and Delete projects and software (CRUD).
11. Receive requests and comments from users.
12. Send notification about new materials for subscribers.
13. View announcement and events from the administrators.

3.3. Non-functional requirement

For the user's convenience and engaging experience, the resulting prototype should be flexible, versatile, responsive and attractive in many aspects. Since it is an emerging technology, it is openly exercising better and more state of the art technology. The graphical user interface or front end of the website should be engaging, understandable, responsive and descriptive graphically, tabular, or iconic ally.

Non-functional requirement

1. The prototype should be amendable and responsive.
2. The user interface should be simple, graphical, operational and user friendly.
3. The prototype should be open to interact with state of the art technologies of cloud storage.
4. The backend or content management system should be adequately secure from unauthorized access.
5. Set up error handling methods in place in case of exception.
6. Compatible with mostly used operating systems and browsers.

3.4. Performance Requirements

i. Hardware consideration

For the website to load properly on a computer the following hardware specification should be considered:

	User's side	System Deployment
Processing power	**32 or 64 bit operating system and Core speed @1.50GHz**	64 bit operating system and Intel(R) core (TM)i3-237M CPU@2GZ
Device Memory	**At least 2GB so that it can successfully load the pages with sufficient buffer storage.**	At least 4GB so that it properly loads the files, interfaces and extensions.

Peripherals	Latest and working network adapter installed.	Latest and working network adapter with server ports and switches.

Table 3-1 Hardware Consideration

ii) Software consideration

The system used to deploy must consist a sophisticated database manager, a queue manager and also server installation software.

The users must possess a system that supports any Operating System since it is basically comprised of HTML and also any web browsers (for better experience: with up-to-date Flash Player and Necessary plugin for the bootstrap effects to take place and video buffering.

Tentative: For the android application- an android device capable of running a minimum of API Level 17 or version 4.2(Jelly Bean)

iii. Necessity

The system is for the time being using CSE Department as there is no standard academic resource management system not only for the CSE Department or entirely for Adama Science and Technology University. So it is essential for the University's Organs like the schools and departments to have such a repository. It is also of paramount importance for the students in terms of study, grades and academics.

iv. Documentation

At the completion of this project, every activity of the whole development, design, implementation, testing and other phases will be documented for future reference and maintenance. There would also be a documentation and a video about how to navigate through the website and the application.

v. Accessibility

The scope of accessibility of this system can be seen from different standpoints:

A student can browse the website to get the materials that he/she needs and then download the material. Or use the application to attain the same need. An instructor logs into its previewed page and upload materials to the website's storage or provide a google drive link that the material can

be accessed from. An administrator can access both the front and back end of the website and make changes as well as upload, remove and view materials on the website.

The android application serves as a dashboard for the students with a list view of the materials with description and download buttons which any student can gain access by downloading the app, installing and then launching the app.

The system is accessible anywhere with an internet connection to load the website as well as to fetch materials for the application. The accessibility can be improved through time by integrating it with different frameworks and cross platform variety.

Generally, the system to operate optimally should be met with accessibility standards such as:

- ✓ A viable internet connection or cellular data network
- ✓ Uninterrupted cloud storage providence
- ✓ A standard visual framework to load all the necessary graphical packages like icons, cards, images and videos.
- ✓ A license from the department verifying the materials are validated and featured by the CSE department.

vi. Reliability and Error Handling

The system should be stable and reliable in terms of the material's authenticity. Students can send feedback about their experience for betterment of the system for the future. The website would be equipped with 404 Error Page and Contact for troubleshooting option. The website would be maintained and monitored closely to avoid major errors and crashes. The android application is will be tested multiple times to avoid unresponsiveness and sudden crashes, it would also be equipped with FAQs section.

3.4.1. Performance Consideration

Performance requirement refers to the optimum response time for the system to function in expected manner. As the website will be accessed by various users at the same time, it should maintain an optimum traffic response pace not to crash down. So the web hosting should be calibrated to sustain a reasonable number of users at a time. It also refers to consideration of the time and space requirement of the system.

Response Time: depending on the strength of the internet connection, the website should in short amount of time approximately 10-30 seconds.

Storage Space: to provide with complete vie and graphical experience, the processor speed should be above 1GB and the latest browser with flash player and plugin must be installed.

3.5. System Model

A system model is basically used to design an abstract form of the system that encompasses major aspects of the system while discarding the irrelevant details. This particular system includes three major models:

1. Functional Model (Scenarios and Use case Model)
2. Object Model (Class Diagram)
3. Dynamic Model (Sequence, Activity and State Diagram)

3.5.1 Scenario

A scenario is a narrative of foreseeable interactions of user roles (known in the Unified Modeling Language as 'actors') and the technical system, which usually includes computer hardware and software. A scenario has a goal, which is usually functional. A scenario describes one way that a system is or is envisaged to be used in the context of activity in a defined time-frame. The time-frame for a scenario could be (for example) a single transaction; a business operation; a day or other period; or the whole operational life of a system. Similarly the scope of a scenario could be (for example) a single system or piece of equipment; an equipped team or department; or an entire organization.

Users precondition

1. Users must have a viable computer with internet browsing capability or an android phone running Android OS higher than 4.2 (Jelly bean).
2. The web browser should have proper flash players and plugins and The phone should have the application installed.
3. The computer or the Phone should have access to an internet connection.

Flow of events:

Website

1. A student opens a web browser application on the computer or smartphone.
2. Types in the address of the website and searches it on the web.
3. Once, the website loads successfully he/she browses the site for what they are looking for.

Android Application

1. A student downloads the application from the web.
2. A student installs the application on the android device and runs the application.

3. A student scrolls and browses for the materials in need.

Website Scenarios

Scenario Name: Browse Website

User precondition: An internet capable device (Computer or Phone) with connectivity

Participating Instance Actors: A student – Ermias

Flow of events:

1. Ermias must open an internet browser and enter the website's address and search it.
2. When the homepage of the website loads successfully, he can scroll down to see all the available services, design, and using the navigation bar – navigate through the website.

Scenario Name: Download a course material

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Biniyam

Flow of events:

1. Biniyam must use an internet browser to search the website using its URL.
2. Once the website loads, Tap on the course material section on the navigation bar at the top.
3. The course material page will load suddenly, then from the list of courses seen there, locate and click on the one that is needed.
4. Then a modal will appear showing what corresponding materials are consisted under the selected course with downloading button option.
5. By touching the download button, biniyam can get the material he needs for his study.

Scenario Name: Download an entire material for a Course

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Esrom

Flow of events:

1. Esrom must use an internet browser to search the website using its URL.

2. Once the website loads, tap on the course material section on the navigation bar at the top.
3. The course material page will load suddenly, then from the list of courses seen there, locate and click on the one that is needed.
4. Then a modal will appear showing what corresponding materials are consisted under the selected course with downloading button option and an entirety download button named Download as Zip button at the bottom of the modal.
5. By touching the Download as Zip button, Esrom can get the complete material for the course he needs for his study.

Scenario Name: Download an assignment, project material or a thesis

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Bisrat

Flow of events:

1. Bisrat must use an internet browser to search the website using its URL.
2. Once the website loads, tap on the projects section on the navigation bar at the top.
3. The Project page will load suddenly, then from the array of project materials categorized and listed, click on the download button that is right under the project to get the project material.
4. As the download is successful, he can enjoy the perks of previous project as a reference for his new project.

Scenario Name: Download a software or a program from the CSE Academic Resource Management System.

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Anteneh

Flow of events:

1. Bisrat must use an internet browser to search the website using its URL.
2. Once the website loads, tap on the software section on the navigation bar at the top.
3. Once a content view of the softwares and program appears, read the descriptions below and their particular uses to decide which software to get.
4. Once that is decided click on the software icon to download and enjoy it.

Scenario Name: Send Feedback to the system administrators

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Amanuel

Flow of events:

1. Amanuel must use an internet browser to search the website using its URL.
2. Once the website loads, tap on the Contact Us section on the navigation bar at the top.
3. The Contact Us page will consist fields to be filled out about the person sending feedback and the message; By filling out those respective fields, click on submit.
4. The filled out information would accordingly be sent to the system administrators via E-Mail.

Scenario Name: Sign Up for New Material Notification

Precondition: Website must be opened on the computer, Student must know what material that he/she would like to download.

Participating instance Actor: A student- Saron

Flow of events:

1. Saron must use an internet browser to search the website using its URL.
2. Once the website loads, at the bottom of the home page there is a footer section with fields of Name and E-mail to be filled to send the notification for a new material upload and arrival.
3. She would fill out those fields and then hit Sign Up button to receive notifications and alerts about a new material.
4. The filled out information would be stored in the website's database as a list for the alert email distribution in the future.

3.5.2 Use case model

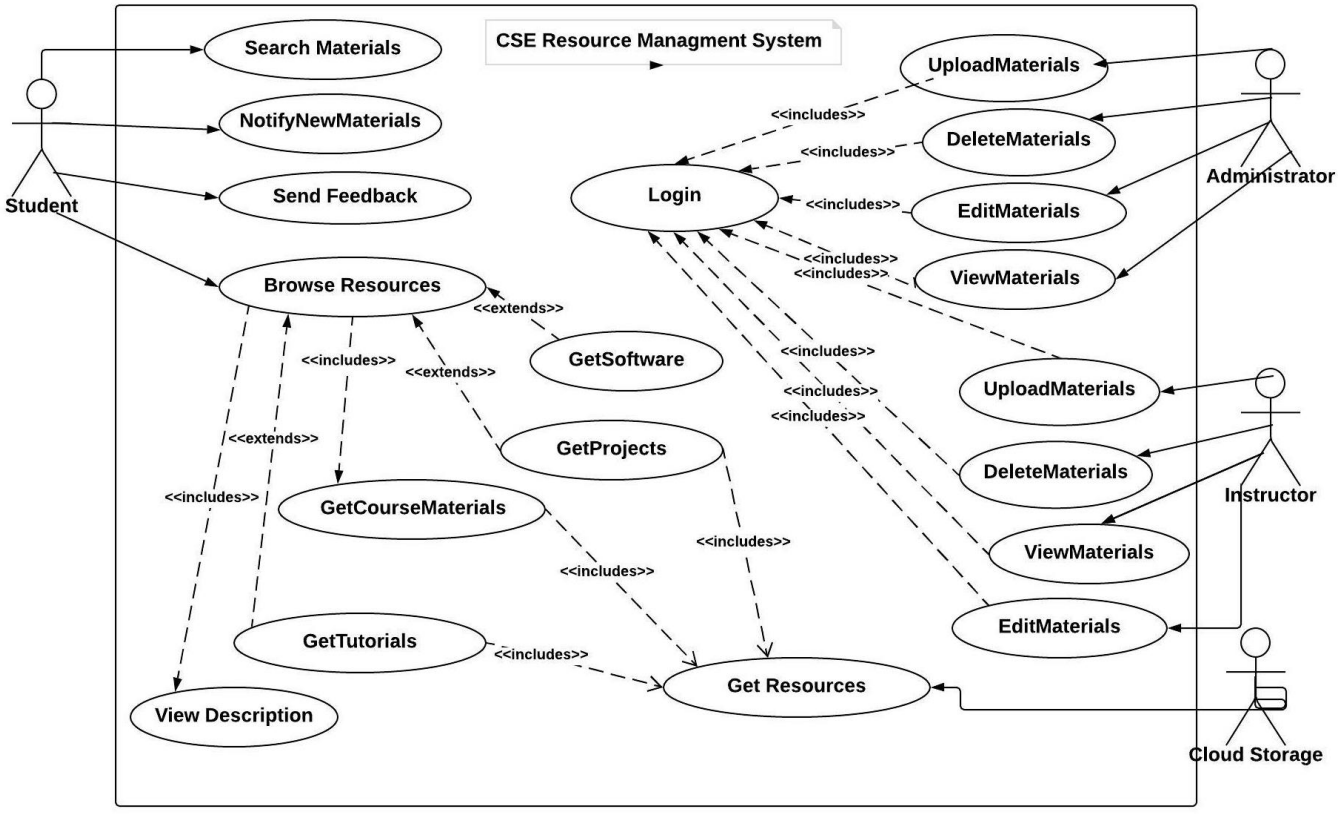

Figure 3-1 Use case model

The use cases used in this system model are:

- Search Materials
- Browse Resources
- Get Course Material
- Get Projects
- Get Software
- Get Tutorial
- View Description
- Send Feedback
- Notify new material
- Get Resources
- Login
- Upload Material
- Edit (Update) Materials

- Delete Materials
- View Materials

3.5.3 Use case description

The following tables explain the use cases in detail. It is assumed that all the necessary preconditions are met for this cases to take place. It is considered that the devices, computers, internet connection, browsers are in working state.

Use case ID	1
Use case name	SEARCH MATERIALS
Actor	Student
Description	The search feature would assist the users in finding what they are looking for quickly with the necessary parameters fulfilled.
Precondition	Student must have access to a working computer or an internet capable device. Student must type in the URL of the website to land on the homepage. Student must enter the correct the right course material name on the search bar.
Flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student enters the right course name on the search bar. 3. Student clicks the search button to search for the course.
Post condition	The search engine searches for the entered parameter name in the indexed course / materials list and browses the ones that match the given search as a search result.
Alternate Flow of events	➢ The search may not find any result or yield exception error.

Table 3-2 search materials use case description

Use case ID	2
Use case name	NOTIFY NEW MATERIALS
Actor	Student
Description	The notification feature would enable the users to keep up with recent changes and help them calibrate their study materials as things evolve in real time.
Precondition	Student must have access to a working computer or an internet capable device as well as a verifiable email address.
Normal flow	1. Student types in the URL of the website and search to land on the homepage.

	2. Student navigates to the bottom of the home page and enter his name and email address that he wants to get the notifications as new materials surface in the future. 3. Student then clicks sign up or submit button to send his request.
Post condition	The student receives a successfully subscribed notice. The name and email fields entered will be kept in list format on the website backend for the admin; to be used while distributing notifications later on.
Alternate Flow of events	➢ The email address has already been registered. ➢ Incorrect name and email entry would result exception.

Table 3-3 Notify new materials use case description

Use case ID	3
Use case name	SEND FEEDBACK
Actor	Student
Description	The feedback property would allow the users to contact the administrators with questions they have or requests for materials to be considered in the future and overall feedback about their experience on the site.
Precondition	Helen must have access to a working computer or an internet capable device.
Normal Flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student navigates to the contact us page from the navigation bar. 3. Student fills out the necessary fields of the contact form. 4. Student then hits the submit query button.
Post condition	The information filled out would be saved on the website's cache space and analyzed accordingly later by the administrators.
Alternate flow of events	➢ Incorrect form entry would result exception.

Table 3-4 Send Feedback use case description

Use case ID	4
Use case name	GET COURSE MATERIALS
Actor	Student
Description	These function is the major function of the website and it is the mechanism that provides the course materials to the students.

Precondition	Student must have access to a working computer or an internet capable device.
Normal flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student navigates to the course material page from the navigation bar. 3. Then browses through the course list. 4. Click on the course that he/she needs the material of. 5. As that particular course's page appear, locate the material to be downloaded. 6. Select the material and then click download or select multiple ones and bulk download.
Post condition	The materials will be downloaded from the cloud storage which has been setup prior to the website's launch. The student then would own that material offline and use it accordingly.
Alternate flow of events	➢ The material in need is not found. ➢ The course in question is not found.

Table 3-5 Get Course Material use case description

Use case ID	5
Use case name	VIEW DESCRIPTION
Actor	Student
Description	These view feature would offer a simple and precise information about the material in question and it will help in deciding which materials to choose.
Precondition	Student must have access to a working computer or an internet capable device.
Normal flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student navigates through the pages by scrolling down the entire page. 3. Or across the different pages to see the descriptions written below, on the sides, on hovering across them, by clicking them. 4. Then view description of materials, projects and software.
Post condition	After seeing the descriptions of the materials and resources on the website, the student would be able to decide on the materials he needs and would have a general understanding and insight of the materials.

Alternate flow of events	➢ Description is not included. ➢ Description is mismatched with descripted one.

Table 3-6 View Description use case description

Use case ID	6
Use case name	GET PROJECTS
Actor	Student
Description	These Projects feature offers a range of projects, assignments and thesis that has previously been done by senior students to be used as a reference.
Precondition	Student must have access to a working computer or an internet capable device.
Normal flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student navigates to the projects page from the navigation bar. 3. Then browses through the project list with pagination at the bottom. 4. Click download on the project, assignment or thesis that he/she is looking for.
Post condition	The material selected would be downloaded either from the cloud storage or website's storage. Once downloaded the material would be available for offline use and used as a study and project reference.
Alternate flow of events	➢ The project in question is not found. ➢ The download button is not fetching the file.

Table 3-7 Get Projects use case description

Use case ID	7
Use case name	GET SOFTWARES
Actor	Student
Description	These Software feature offers a variety of software, programs, digital tools that are essential for the CSE education and career.
Precondition	Student must have access to a working computer or an internet capable device.
Normal flow of events	1. Student types in the URL of the website and search to land on the homepage. 2. Student navigates to the software page from the navigation bar. 3. Then browses through the software list with pagination at the bottom.

	4. Click download on the software that he/she is looking for. 5. Or Go to the official page providing that particular software.
Post condition	The software selected would be downloaded either from the website's storage or associated software's official website. Once downloaded the material would be available offline, then installed and worked upon accordingly.
Alternate flow of events	➢ The software in question is not found. ➢ The download button is not fetching the file. ➢ The official page could not be redirected.

Table 3-8 Get Software use case description

Use case ID	8
Use case name	GET RESOURCES
Actor	Cloud Storage
Description	This attribute is offered by the cloud storage service and consists of resources that are stored and organized there.
Precondition	Google drive would consist the material stored prior and would offer them using chain link method for third party download with generated links that are embedded with the download buttons on the website.
Normal flow of events	1. Cloud storage would offer the storage space and the sharing links for the materials. 2. As a configured download button is clicked, the cloud provide that material for download option.
Post condition	The generated and embedded links would allow users to access and download materials and it would accomplish the GET MATERIALS, GET PROJECTS and GET SOFTWARE operations.
Alternate flow of events	➢ Cloud storage service is not online. ➢ Generated link no longer working or expired.

Table 3-9 Get Resources use case description

Use case ID	9
Use case name	LOGIN
Actor	Administrator or Instructor
Description	This Checkpoint is an authentication procedure to gain entire access to the backend of the website. It is a portal to have access to the entire system and oversee the overall activity.
Precondition	The Administrator should have the proper authentication information like the User Name and Password to Log In.
Normal flow of events	1. Administrator or Instructor types in the URL of the website and search to land on the homepage. 2. Student navigates to the login page from the navigation bar. 3. The login page appears with username and password field. 4. Admin or instructor put in the correct login information; the username and password to be authenticated to the backend. 5. Then click login button. 6. The admin or instructor area would be logged in.
Post Condition	Administrator or instructor would be able to access the Content management system from the backend used to invoke the following processes: UPLOAD MATERIALS, VIEW MATERIALS, DELETE MATERIALS and EDIT MATERIALS.
Alternate flow of events	➢ Incorrect username and/ or password ➢ User not found in database.

Table 3-10 Login use case description

Use case ID	10
Use case name	UPLOAD MATERIALS
Actor	Administrator or Instructor
Description	This feature is used to put up or upload materials to the website so that students can get the materials at the front end of the website.
Precondition	The admin or instructor should have proper username and password. The admin or instructor should have the material that he/she wants to upload (know its file location) and have the proper information about the material to be uploaded that would be filled out in fields when uploading.
Normal flow of events	1. The admin or instructor logs into the backend. 2. Then using the dashboard and navigation, locate upload option for material, project or software. 3. Click on upload option. 4. Fill out the upload form, choose the file to upload or provide cloud link. 5. Click on upload material button at the bottom.

Post condition	The material would be stored either in the website's storage or assigned to an offsite cloud storage that would make the material available for the users (students) to be downloaded.
Alternate flow of events	➢ Unsuccessful Login attempt. ➢ File size above limit. ➢ File to upload not found.

Table 3-11 Upload Material use case description

Use case ID	11
Use case name	EDIT MATERIALS
Actor	Administrator or Instructor
Description	This feature is used to update materials uploaded prior to the website so that students can get the latest and correct materials.
Precondition	The admin or instructor should have proper username and password. The administrator should have the material that he wants to update (know its file location) and have the proper information about the material to be updated that would be filled out in fields when uploading.
Normal flow of events	1. The admin or instructor logs into the backend. 2. Then using the dashboard and navigation, locate edit option for material, project or software at view page. 3. Click on edit option. 4. Fill out the update form, choose the file to upload or provide cloud link. 5. Click on update material button at the bottom after editing.
Post condition	The material information would be updated and stored either in the website's storage or assigned to an offsite cloud storage that would make the material available for the users (students) to be downloaded.
Alternate flow of events	➢ Unsuccessful Login attempt. ➢ File size above limit. ➢ File to upload not found. ➢ No updates or changes made.

Table 3-12 Edit Material use case description

Use case ID	12
Use case name	DELETE MATERIALS
Actor	Administrator or Instructor
Description	This feature is used to delete materials uploaded before to the website.

Precondition	The admin or instructor should have proper username and password. The admin or instructor should decide on the material to be deleted that is no longer needed in the system.
Normal flow of events	1. The admin or instructor logs into the backend. 2. Then using the dashboard and navigation, locate delete option for material, project or software at view page. 3. Click on delete option. 4. The system would verify deletion by asking "Are you sure you want to delete?" 5. Click on yes option.
Post condition	The material information would then be deleted and no longer be accessed afterwards.
Alternate flow of events	➢ Unsuccessful Login attempt. ➢ Cancel deletion at verification stage.

Table 3-13 Delete Material use case description

Use case ID	10
Use case name	VIEW MATERIALS
Actor	Administrator or Instructor
Description	This feature is used to view a list of materials currently recorded on the website in a tabular format.
Precondition	The admin or instructor should have proper username and password.
Normal flow of events	1. The admin or instructor logs into the backend. 2. Then using the dashboard and navigation, locate the view option for materials, projects or software. 3. Click on view option. 4. The system would show a tabular format view of materials that is selected.
Post condition	The admin or instructor would be able to see the entire record of materials in an informative view.
Alternate flow of events	➢ Unsuccessful Login attempt. ➢ Viewing an empty table.

Table 3-14 View Material use case description

3.6 Object Model

3.6.1. Data dictionary

The data dictionary is used to define each class contain in the system and the member of class like attribute, operation and description about the classes.

Class	Attributes	Operation	Description
Subscribers	As included in class diagram	As included in class diagram	Consists of a subscribers information; later used to invoke sendNotify method.

Notification	As included in class diagram	As included in class diagram	Holds information about the notification; sent to subscribers' class.
Administrator	As included in class diagram	As included in class diagram	Holds information and task about the administrators.
Instructors	As included in class diagram	As included in class diagram	Holds information and task about the instructors.
Course	As included in class diagram	As included in class diagram	Contains the data about courses in the department.
Material	As included in class diagram	As included in class diagram	Has the information about materials regarding a certain course.
Projects	As included in class diagram	As included in class diagram	Consists of data and location for projects in the database.
Software	As included in class diagram	As included in class diagram	Contains the information about software materials that are registered in the system
Tutorial	As included in class diagram	As included in class diagram	Has objects about tutorial resources in the system.
Cloud Storage	Name	Generate()	Holds the specification about the cloud storage.
Message	As included in class diagram	As included in class diagram	Consists of data and specification about messages received in feedback section
Generalized backend user	As included in class diagram	As included in class diagram	A normalized and driven class from administrator and instructor.
Announcement	As included in class diagram	As included in class diagram	Contains data and specification about announcements, events and posts.

3.6.2 Class diagram

The Class diagram captures the logical structure of the system; the classes and things that make
up the model. It is a static model, describing what exists and what attributes and behavior it has, rather than how something is done. Class diagrams are most useful to illustrate relationships between classes and interfaces.

It shows the classes of the system and their interaction which are typically used to explore domain concept, analyze requirement in the form of conceptual analyses model.
A class diagram is typically modeled rectangles with three-section:

- **the top one indicates the name of the class,**
- **the middle one lists the attributes of the class and**
- **the third one lists the methods.**

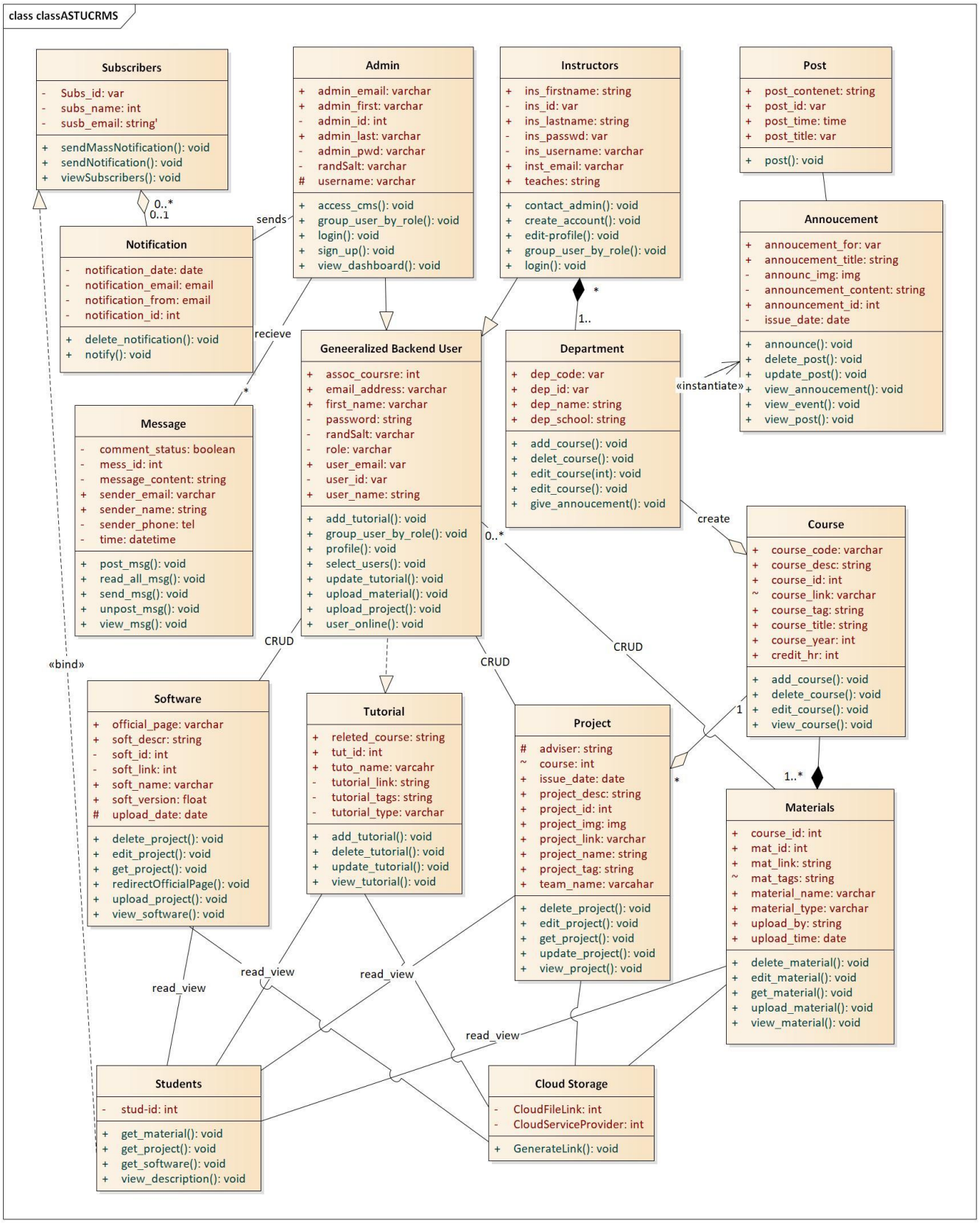
class classASTUCRMS
Subscribers
- Subs_id: var
- subs_name: int
- susb_email: string'
+ sendMassNotification(): void
+ sendNotification(): void
+ viewSubscribers(): void
Admin
+ admin_email: varchar
+ admin_first: varchar
- admin_id: int
+ admin_last: varchar
- admin_pwd: varchar
- randSalt: varchar
username: varchar
+ access_cms(): void
+ group_user_by_role(): void
+ login(): void
+ sign_up(): void
+ view_dashboard(): void
Instructors
+ ins_firstname: string
- ins_id: var
+ ins_lastname: string
- ins_passwd: var
- ins_username: varchar
+ inst_email: varchar
+ teaches: string
+ contact_admin(): void
+ create_account(): void
+ edit-profile(): void
+ group_user_by_role(): void
+ login(): void
Post
+ post_contenet: string
+ post_id: var
+ post_time: time
+ post_title: var
+ post(): void
Annoucement
+ annoucement_for: var
+ annoucement_title: string
- announc_img: img
- announcement_content: string
+ announcement_id: int
- issue_date: date
+ announce(): void
+ delete_post(): void
+ update_post(): void
+ view_annoucement(): void
+ view_event(): void
+ view_post(): void
Notification
- notification_date: date
- notification_email: email
- notification_from: email
- notification_id: int
+ delete_notification(): void
+ notify(): void
Geneeralized Backend User
+ assoc_coursre: int
+ email_address: varchar
+ first_name: varchar
- password: string
- randSalt: varchar
- role: varchar
+ user_email: var
- user_id: var
+ user_name: string
+ add_tutorial(): void
+ group_user_by_role(): void
+ profile(): void
+ select_users(): void
+ update_tutorial(): void
+ upload_material(): void
+ upload_project(): void
+ user_online(): void
Department
+ dep_code: var
+ dep_id: var
+ dep_name: string
+ dep_school: string
+ add_course(): void
+ delet_course(): void
+ edit_course(int): void
+ edit_course(): void
+ give_annoucement(): void
Message
- comment_status: boolean
- mess_id: int
- message_content: string
+ sender_email: varchar
+ sender_name: string
- sender_phone: tel
- time: datetime
+ post_msg(): void
+ read_all_msg(): void
+ send_msg(): void
+ unpost_msg(): void
+ view_msg(): void
Course
+ course_code: varchar
+ course_desc: string
+ course_id: int
~ course_link: varchar
+ course_tag: string
+ course_title: string
+ course_year: int
+ credit_hr: int
+ add_course(): void
+ delete_course(): void
+ edit_course(): void
+ view_course(): void
Software
+ official_page: varchar
+ soft_descr: string
- soft_id: int
- soft_link: int
+ soft_name: varchar
+ soft_version: float
# upload_date: date
+ delete_project(): void
+ edit_project(): void
+ get_project(): void
+ redirectOfficialPage(): void
+ upload_project(): void
+ view_software(): void
Tutorial
+ releted_course: string
+ tut_id: int
+ tuto_name: varcahr
- tutorial_link: string
- tutorial_tags: string
- tutorial_type: varchar
+ add_tutorial(): void
+ delete_tutorial(): void
+ update_tutorial(): void
+ view_tutorial(): void
Project
adviser: string
~ course: int
+ issue_date: date
+ project_desc: string
+ project_id: int
+ project_img: img
+ project_link: varchar
+ project_name: string
+ project_tag: string
+ team_name: varcahar
+ delete_project(): void
+ edit_project(): void
+ get_project(): void
+ update_project(): void
+ view_project(): void
Materials
+ course_id: int
+ mat_id: int
+ mat_link: string
~ mat_tags: string
+ material_name: varchar
+ material_type: varchar
+ upload_by: string
+ upload_time: date
+ delete_material(): void
+ edit_material(): void
+ get_material(): void
+ upload_material(): void
+ view_material(): void
Students
- stud-id: int
+ get_material(): void
+ get_project(): void
+ get_software(): void
+ view_description(): void
Cloud Storage
- CloudFileLink: int
- CloudServiceProvider: int
+ GenerateLink(): void
0..*
0..1
sends
recieve
*
1..
«instantiate»
create
0..*
CRUD
CRUD
CRUD
CRUD
«bind»
1
*
1..*
read_view
read_view
read_view
read_view

Figure 3-2 Class diagram

3.7 Dynamic model

3.7.1 Sequence diagram

A sequence diagram in a UML is a kind of interaction diagram that shows how processes operate with one another and in what order.

- ✓ **Upload Material:** To upload a file our website as admin first use any browser to start then insert administrator's URL. Then admin homepage will displayed. There are 4 options to choose. Admin will select upload option automatically upload page will displayed and ask to choose and insert a file to upload .then add a file and click upload material. System finally send a successfully uploaded message.

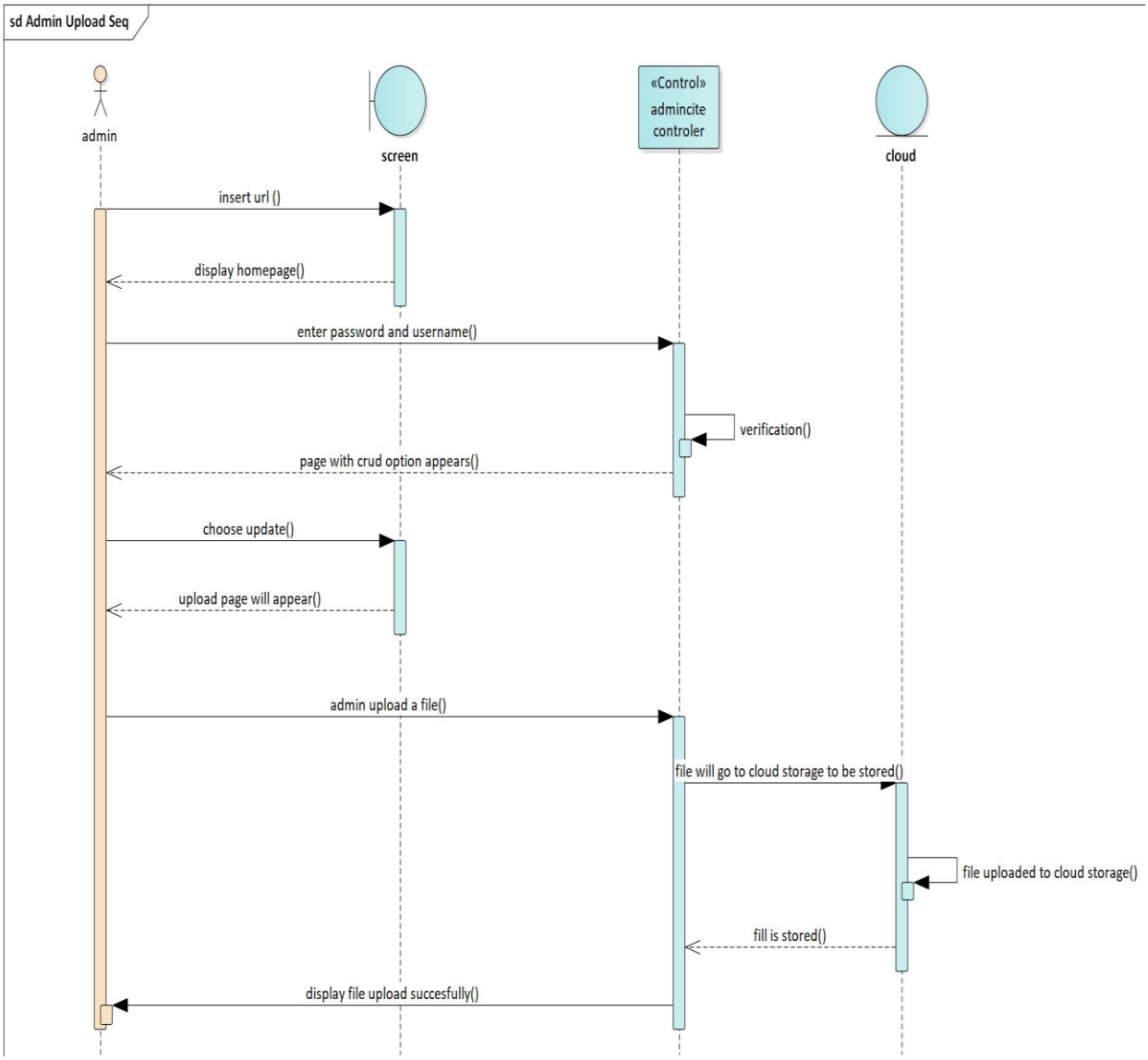

Figure 3-3 Upload Material Sequence diagram

- ✓ **Search Material:** To search a file from our website first use any browser to start then insert website's URL. When homepage appear at the screen there is search engine to enter any character to search then click search button. After that the system check whether search exist or not by index at cloud or website storage. Then the system return file if exist but if not exist system will respond no search found.

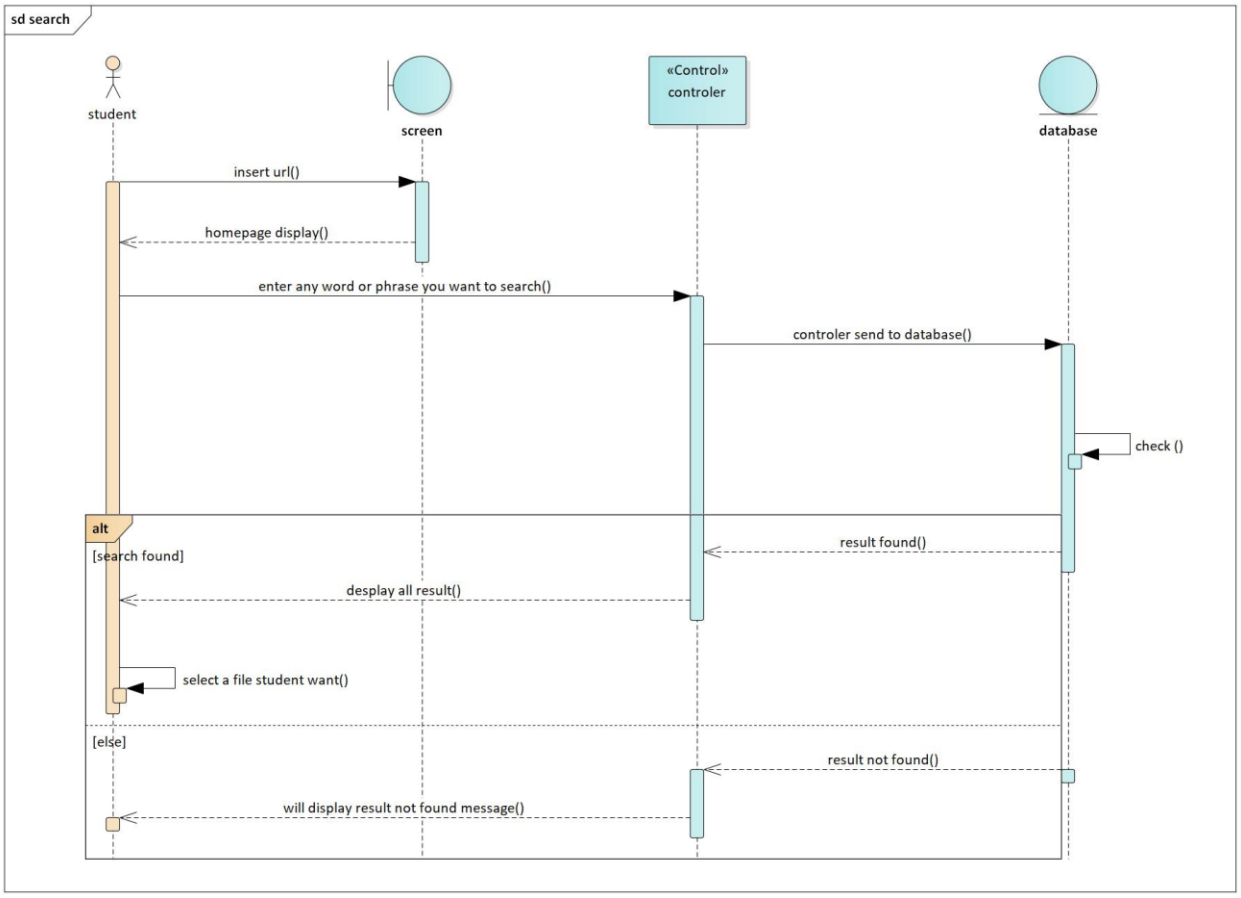

Figure 3-4 Search Material Sequence diagram

Delete Material: To delete a file from the website as admin first use any browser to start then insert admin URL. Then admin homepage will displayed. There are 4 options to choose. Admin will select delete option; automatically delete page will displayed and ask to choose a file to delete .then delete a file and click delete. System finally send a successfully deleted message.

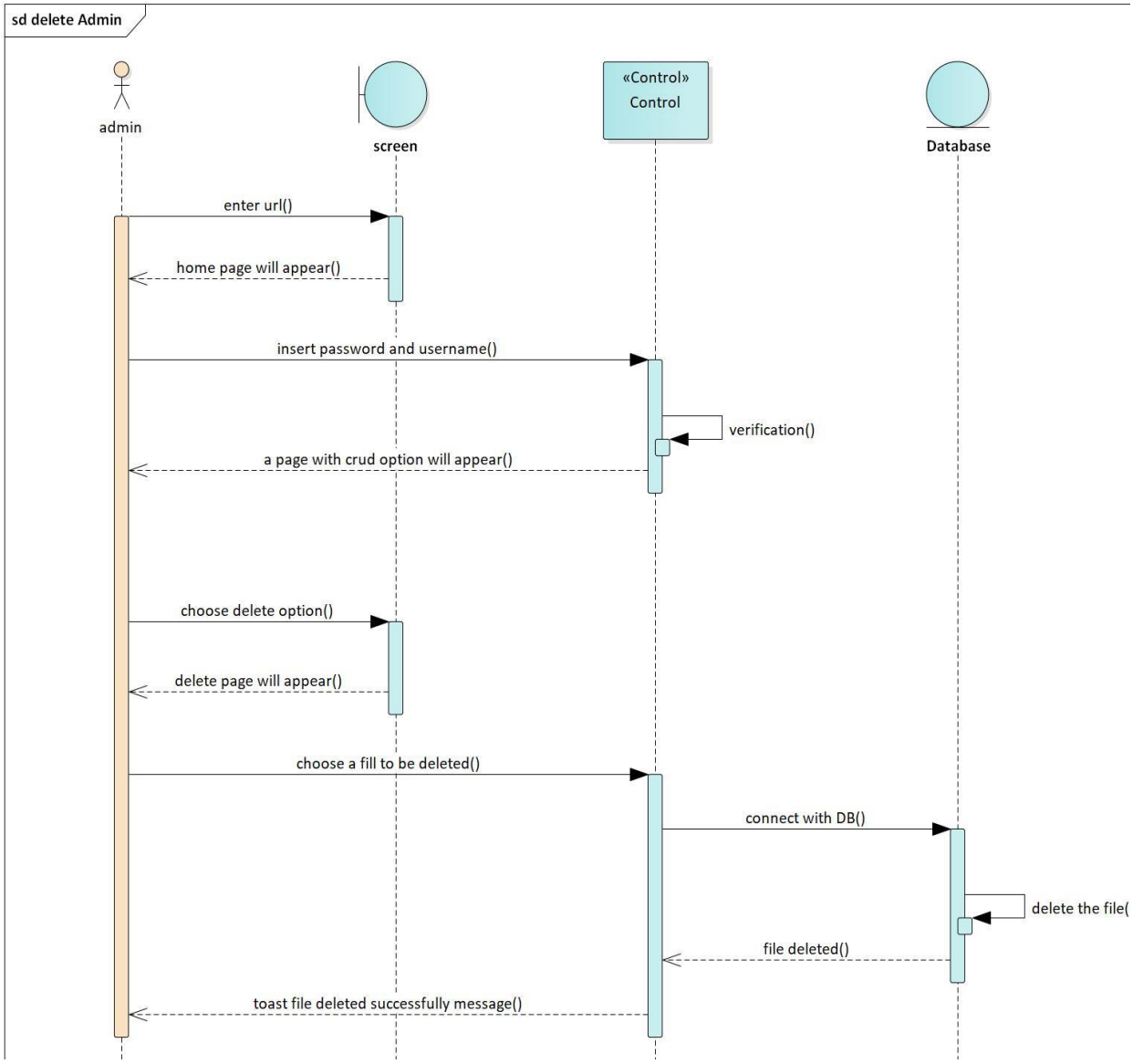

Figure 3-5 Delete Material Sequence diagram

Notify New Material (Subscription): To get notified when a new file is uploaded to the website first use any browser to start then insert assistastu URL. To get notification in our website or to subscribe you must insert name and email. After that the system will process your entry and display a successfully subscribed message.

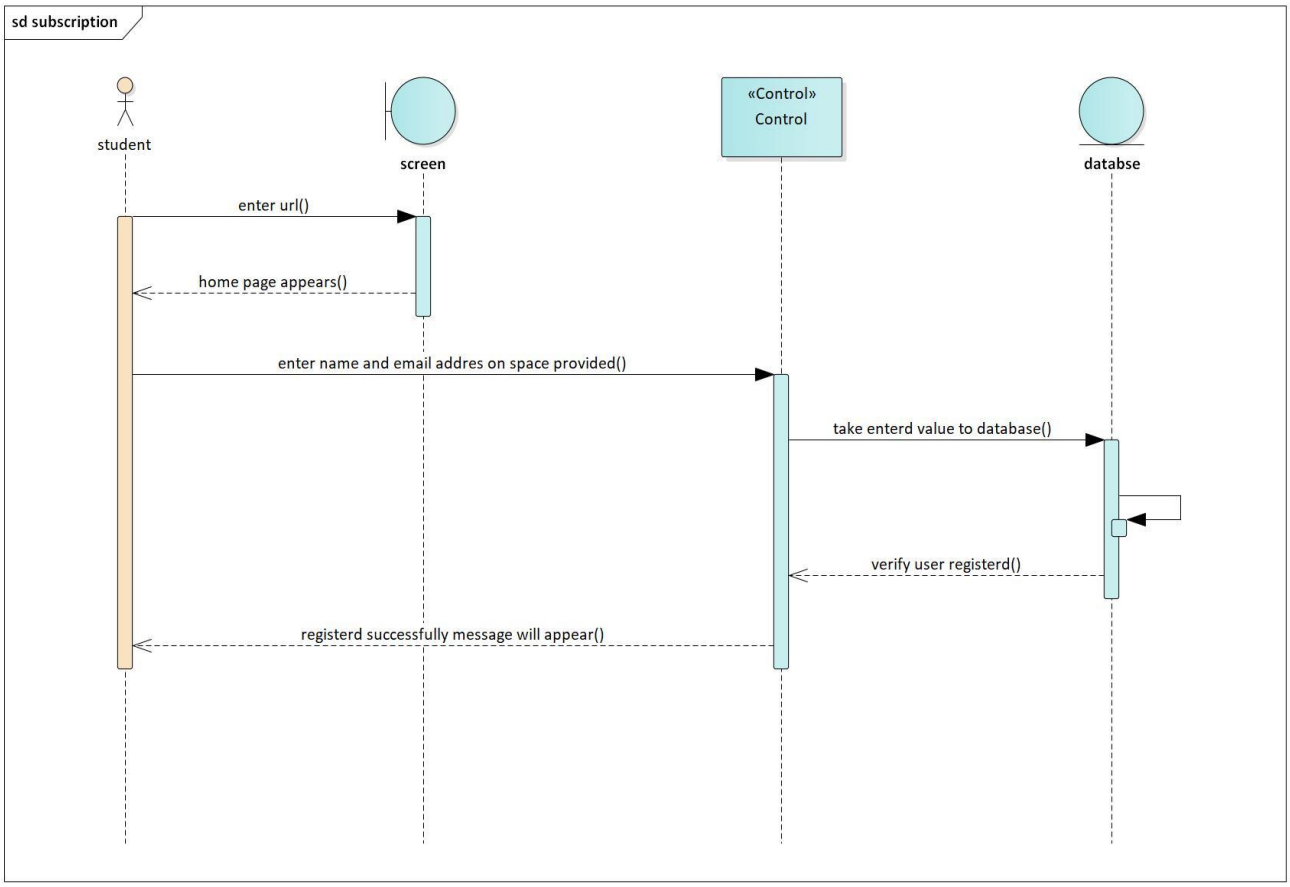

Figure 3-6 Notify New Material (subscribe) Sequence diagram

3.7.2 Activity diagram

Search Material: the activity diagram shown below indicates the search material activity. After the user runs the website and get in to it. The user can add the materials he/she wants to the search field then he/she can get the material easily.

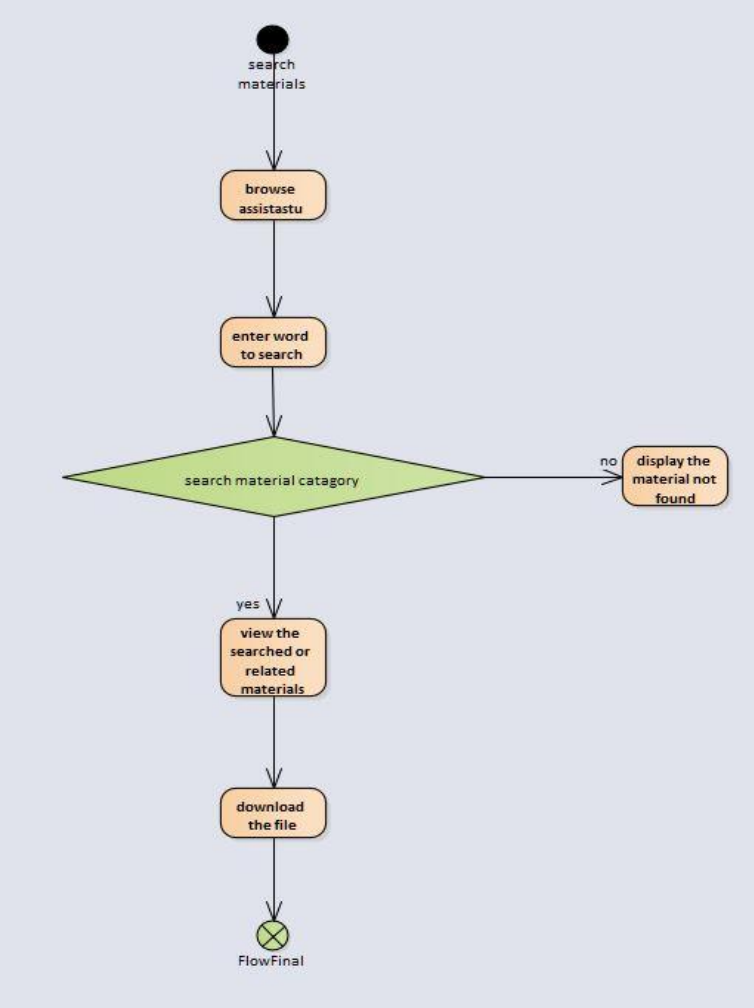

Figure 3-7 Search Material Activity diagram

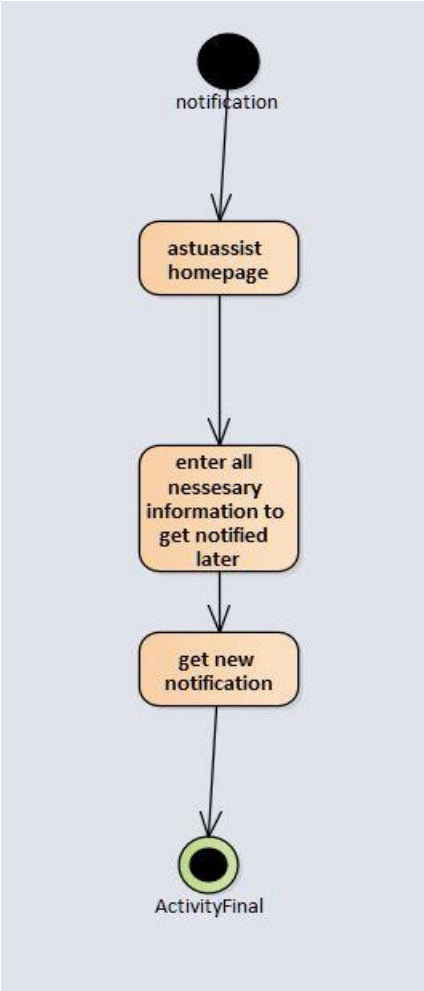

Figure 3-8 Notify New Material Activity diagram

Notify New Material: the activity diagram shown above indicates the notification activity. After the client runs the website and get in to the homepage of the website. Then after the needed information is filled in the space provided after that the client get the new notifications.

Send Feedback: the activity diagram shown below indicates the feedback activity. After the user opens the website and get in to the homepage of the website. Then get in to the contact us after that by filling the needed info, the client will receive feedback afterwards.

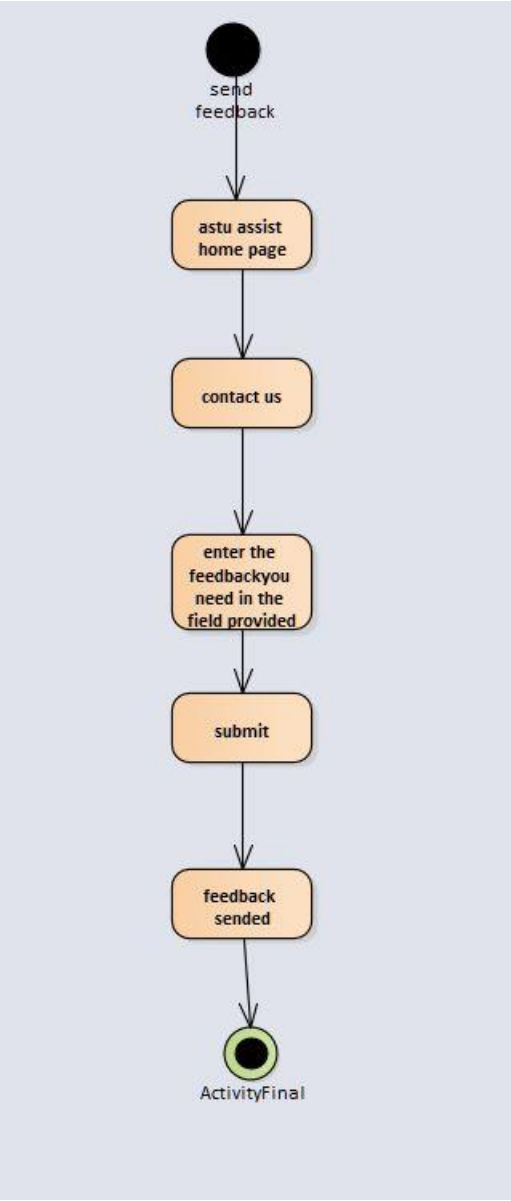

Figure 3-9 Send Feedback Activity diagram

3.7.3 State Diagram

View Material: the following state diagram show how user can easily view the course materials by clicking on the material button from the home page then can see what course material that we have on the web.

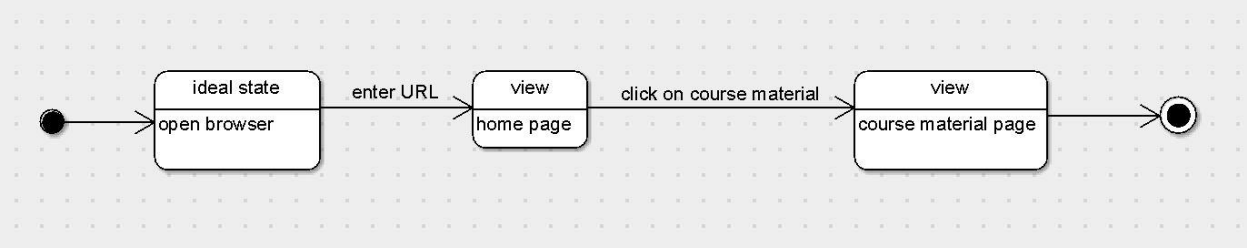

Figure 3-10 View Material State diagram

Search and Download Material: the following state diagram shows how to download a course material easily. The user can get the course material by *clicking on search bar* then type the course name or course code then it will show up the course list and the course material category will also will come up next which is whether it is project, assignment, software's, tutorial, reference books, work sheet Then the user *clicks on download button* to download the file.

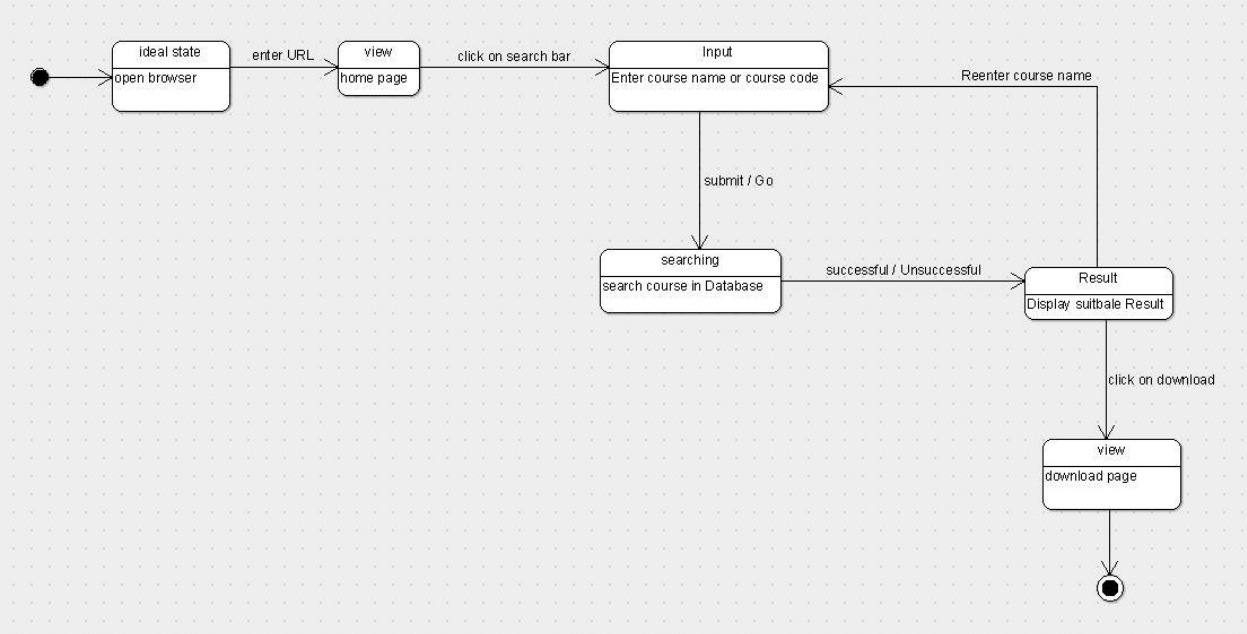

Figure 3-11 Search and Download State diagram

Send Feedback: the following state diagram shows how the user can contact us in order to send us any feedbacks and questions that they will raise by *clicking contact us button* on the home page to be redirected to another page then the user will insert his/her email and password then write the message they have by *clicking on message box.*

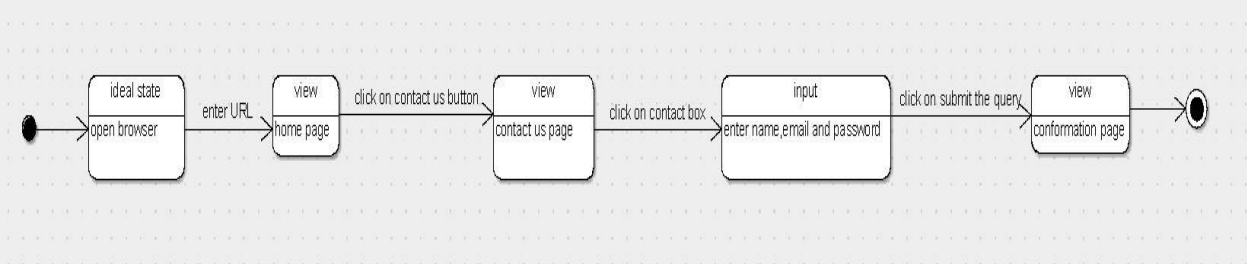

Figure 3-12 Send Feedback State diagram

Upload Material: the following state diagram shows how the admin or the instructor can upload a file by logging into the web writing the website's on URL then the admin or instructor will login using his/her email and password. Then the dashboard page will come next so that they will choose the course name that he/she wants to upload by *clicking on dropdown button* so that he/she will choose the course and the course category in order to upload the material. After that the admin or instructor will logout from the page by *clicking logout button*.

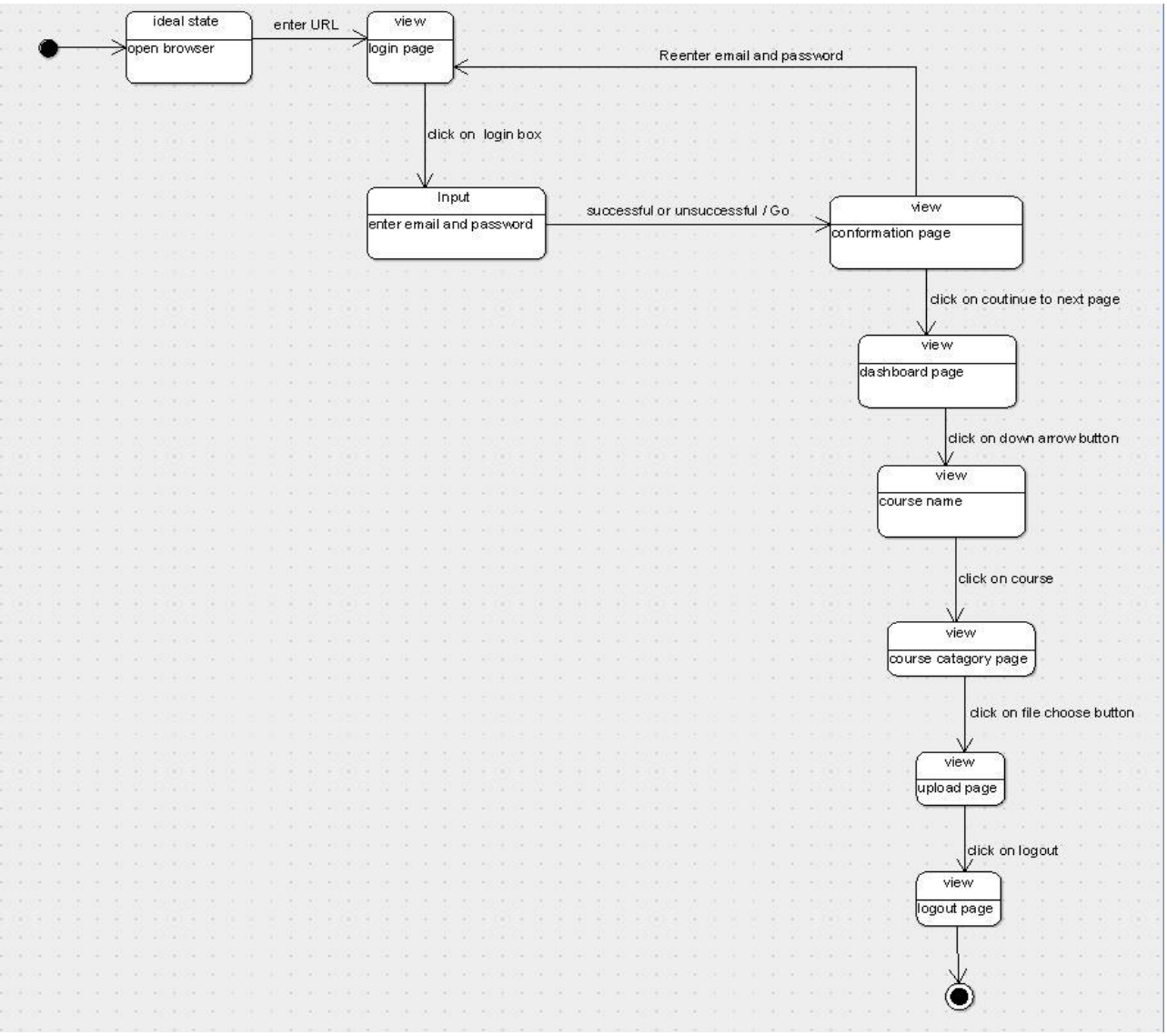

Figure 3-13 Upload Material State diagram

3.7.4 User interface

- **Home Page – Navigation Bar**
  The website's homepage would look like a landing page with general information and directions. It would contain a navigation bar which looks like the figure below; with buttons directing to the other pages. It would be responsive in mobile devices with slight change of drop down menu. It would also contain the logo and the system name.

Figure 3-14 Homepage Navigation Bar

- **Course Materials:** The course material page would have a content view with cards. The cards would show course name, course code, with options embedded internally to download the materials.

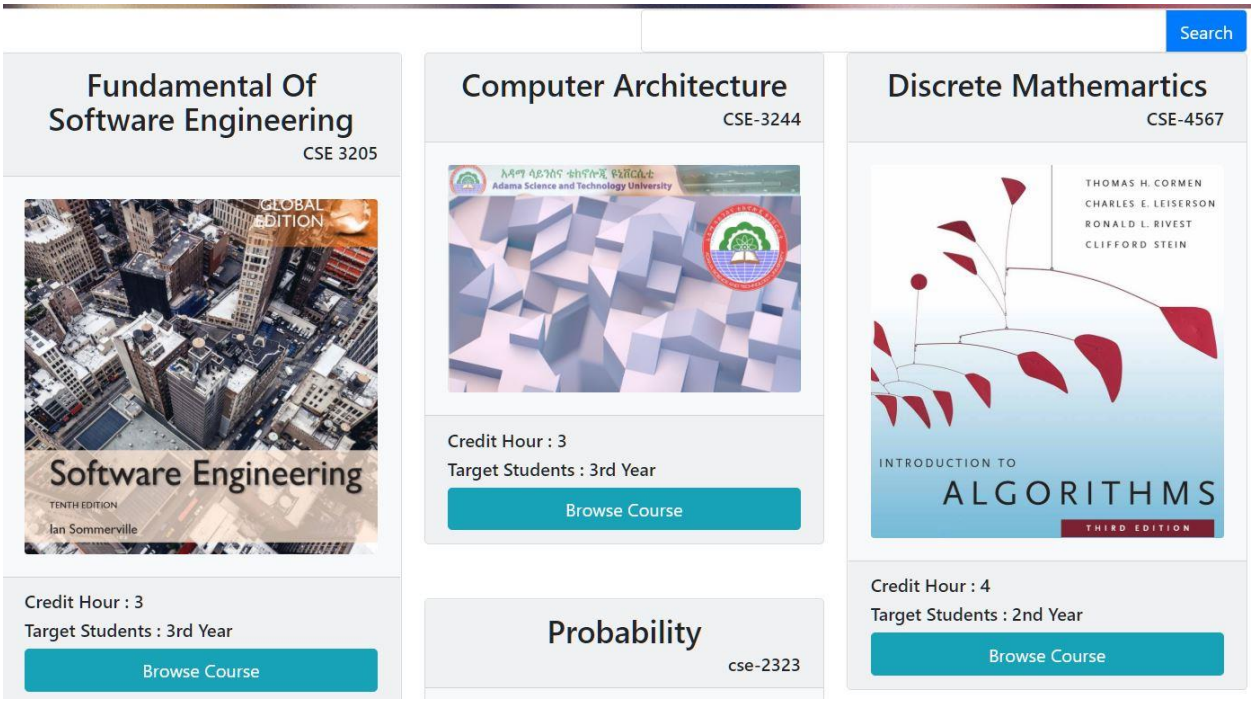

Figure 3-15 Course Material View

- **Search Material:** This option would be available on the home or other pages that would enable the user to quickly search for the materials he/ she needs. That would bring up a result page showing materials matching search parameter or no results if there aren't any matches.

- **Administrator or Instructor Login:** This portal would authenticate administrators and instructors to the back end of the website when a correct Username /Email and Password is entered in the given fields. Which would lead to a dashboard with options t view, upload and delete materials.

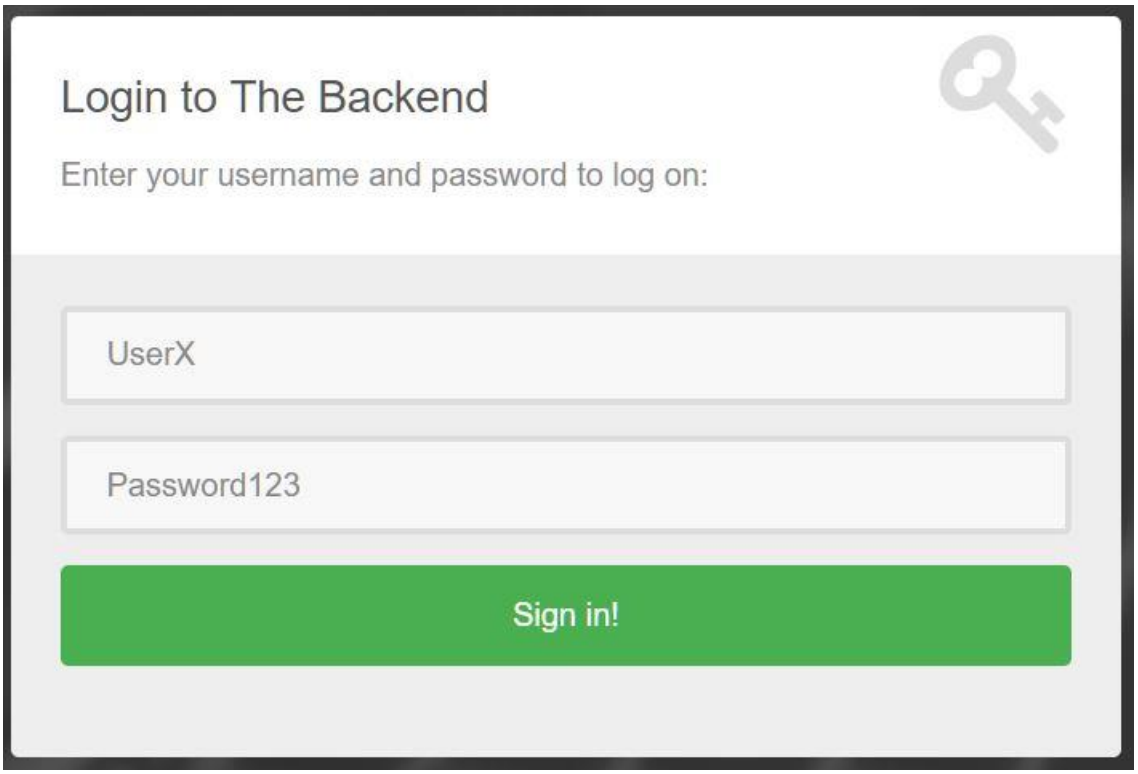

Figure 3-16 Login Interface

- **Notify New Material:** If a user wants to keep up with changes in materials and announcements, he /she can sign up for a newsletter by entering Name and Email address in the given interface format.

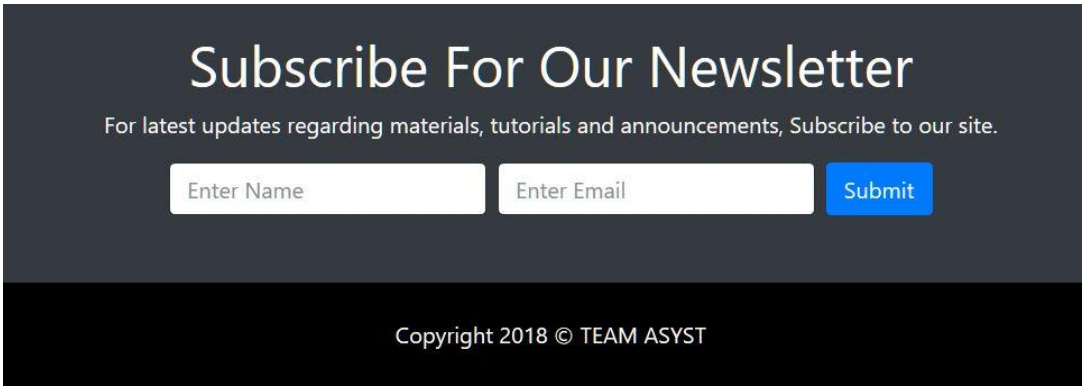

Figure 3-17 Notification Subscription Interface

- Send Feedback: A user can contact the website administrators by entering necessary information and message that would be a feedback or to suggest a material to upload

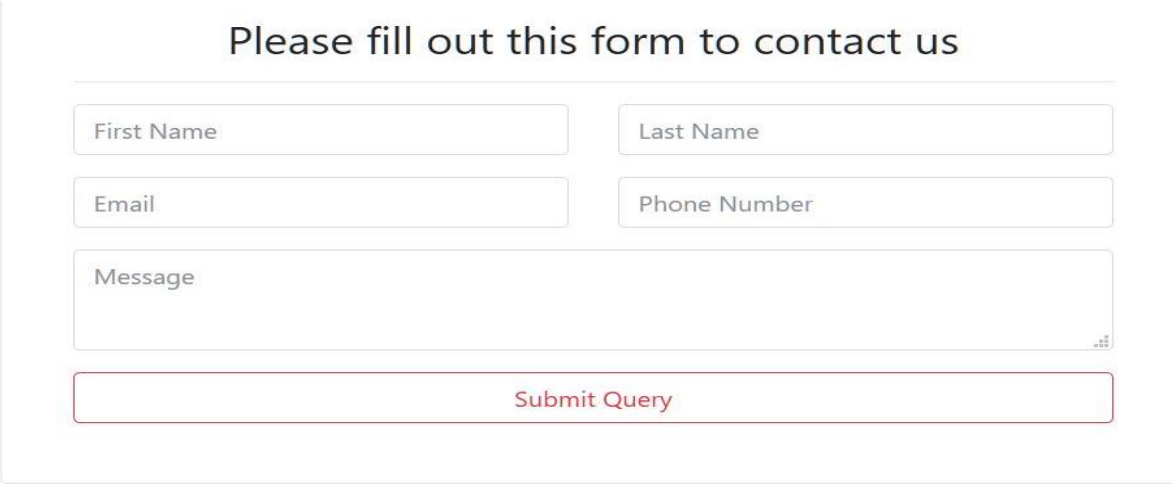

Figure 3-18Feedback Contact Form Interface