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REQUIREMENT MODEL FOR E-COURSES MANAGEMENT SYSTEM IN IRAQI UNIVERSITIES: A CASE STUDY AT THI-QAR UNIVERSITY

بناء نموذج متطلب لادارة نظام الكورسات الالكترونية في الجامعات العراقية: حقل الدراسة جامعة ذي قار

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ABSTRACT

The aim of this study is to construct and utilize a requirement model as basis to develop e-Courses Management System (eCMS) so as to overcome all courses issues in the university in a proper and effective way. This case study which focuses on e-courses activity as the domain of study was conducted at Thi-Qar university. So hopefully that this constructed model will help system developers to understand the requirements to build the system that includes concept, flow and procedures in managing e-courses activities. The observation, interview, and requirement model analysis were used in this study as fact-finding techniques to define the requirements, Unified modeling language (UML) have been used to construct this requirement model that consists of certain model diagrammatical such as use case diagrams, class diagrams, activity diagrams and interaction diagrams (sequence diagrams and collaboration diagrams) and supported by certain textual information like use case specification and requirements list that consisted of 32 functional requirements and 12 non-functional requirements that were needed to construct requirement model for eCMS. However, in this study only functional requirements be captured. This model is validated by using test script technique and sample system (prototype). eCMS is proposed to be a web-based system that enables better communication regardless of time, and location of users. This study provided a better solution to develop eCMS that can be implement at all universities as well as the related education organizations in Iraq.

الخلاصة

الهدف من هذه الدراسة هو بناء واستخدام نموذج متطلب وجعله كقاعدة لتطوير نظام ادارة الكورسات بصورة الكترونية (*eCMS:e-Course Management System*) وذلك للتغلب على جميع المشاكل التي تواجه نظم ادارة الكورسات بطريقة مناسبة وفعالة. قد اختيرت جامعة ذي قار كحقل للدراسة لتطبيق هذا النموذج المتطلب. لذلك نأمل أن هذا النموذج سوف يقدم مساعدة لمطوري النظم لفهم المتطلبات اللازمة لبناء النظام والتي تتضمن المفاهيم ، والمخططات والإجراءات المطلوبة في إدارة فعاليات الكورسات الإلكترونية, وقد تم استخدام عدة طرق لجمع المعلومات والبيانات كاالملاحظة ، المقابلة ، وتحليل نماذج لنظم اخرى لها علاقة بهذا النموذج المتطلب من اجل تقصي الحقائق والتقنيات اللازمة لتحديد احتياجات المستخدمين, وكذلك تم استخدام لغة النمذجة الموحدة (UML) لتحليل وبناء هذا النموذج والتي تتكون من نماذج معينة من المخططات مثل مخططات واقعة الاستخدام (use cases diagrams)، مخططات الصنفيات(classes diagrams) , مخططات التعاون والتتابع(interactions diagrams) ,مخططات الفعاليات او الانشطة(activities diagrams) وقد دعمت تلك المخططات مجموعة من المعلومات الاضافية مثل معلومات لوصف مخططات واقعة الاستخدام(use cases specifications) وقائمة بمتطلبات المستخدمين (requirements list) لبناء هذا النموذج والتي تتألف من 32 متطلب وظيفي (functional requirement) و 12 متطلب غير وظيفي (Non-functional requirement). على اية حال ففي هذه الدراسة تم العمل فقط على انجاز المتطلبات الوظيفية وقد تم التحقق من صحة هذا النموذج باستخدام تقنية اختبار المتطلبات الوظيفية(functionality testing) . وقد اقترح *eCMS* كي يكون نظام متداول على شبكة الانترنت لتوفير افضل اتصال بغض النظر عن الوقت ومكان المستخدم. وقد قدمت هذه الدراسة أفضل حل لتطوير *eCMS* الذي يمكن تطبيقه في جميع الجامعات و المؤسسات ذات الصلة بالتعليم في العراق.

1. INTRODUCTION

The main objective of the requirements model construction is to identify the objects of a problem domain and to understand and explain how they intract with one another [1]. In addition, Dennis et al. [2] describes that a requirement is simply a statement of what the system should do or what characteristic it should have. The developer shall notify the system requirements on the basis of requirements analysis relevant user's perspective first. A course management system (CMS) is defined as a software package or integrated platform that contains a series of web-based tools to support a number of courses activities [3] . The implementation of the CMSs in the universities promised better quality, learner-centered education and claimed that it would deliver more independent and active students [4] . By other words, a combination of e-learning technologies and F2F (Face to Face) courses leads to best interaction between students and teachers. Leitch and Davis [5] explained that the information system approach is required to recognize the structure that is desired to organize the activities and operations within organization. Barker [6] stated that the significance of requirements modeling technology because system requirements touch everything and everyone associated with the system. Therefore, Construct a requirement model is one of the importance techniques to initialize the system requirement. For university courses, a combination of e-learning technologies and F2F courses greater accessibility, flexibility and choice for students, teachers interactively. In Iraqi Universities, there are many students could not communicate with the daily educational curriculum because of the bad situation in Iraq after the last war at 2003. They face many problems to interact with this curriculum . In addition, availability problems come into sight in the research case study. For such a flexible facility of learning, which makes the interaction between the lecturers and their students more effective and useful. This solution could be presented by providing e-courses management system. In order to have a complete system that can fulfil all requirement system, eCMS requirement model for Iraqi universities (a case study at Thi-Qar University) should be constructed firstly. The purpose of this research to perform a requirement model for eCMS in Iraqi universities based on the user requirements. Thi-Qar University is chosen as the domain of study for this research . This model will help to implement eCMS to record, manage as well as monitor all e-courses issues effectively, espesially ; in Iraqi universities.

2. RESEARCH METHODOLOGY

This section includes the appropriate methods and techniques to accomplish the requirement model in this study. The Object-Oriented (OO) approach with Unified Modeling Language (UML) notation was used to model all the requirements of eCMS. Figure 1 describes the requirement analysis phase of system analysis approach by Whitten *et al.* [7] will involve in three main phases.

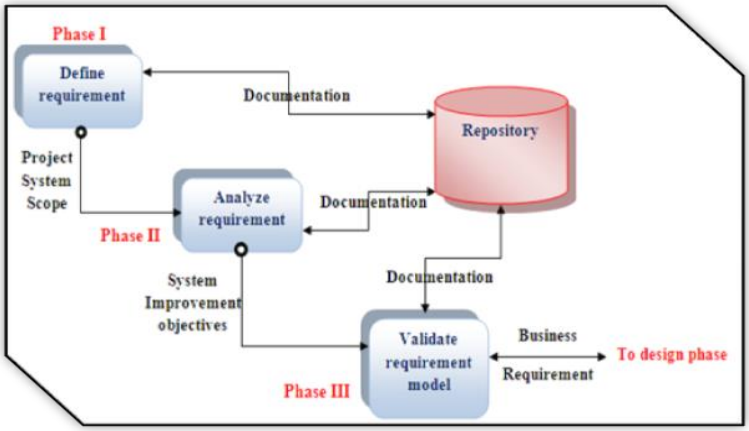


Figure 1: The system analysis phase of a requirement model

2.1 Define requirement phase

The three fact finding techniques such as review of the existing software application, observation and interview were used to gather the user requirements for eCMS.

2.1.1 Review of the Existing Software Application

Based on the comparison result of some software application for different countries such as e-School Management System (e-SMS),School Information Management System (SIMS) and eSekolah system, found these systems have some suitable Characteristics and functions to manage the functionalities of users in the current system and can be followed in order to create or produce a better requirement for eCMS .Most of these Characteristics that captured in eCMS were to facilitate interaction and communication between student and his/her college, especially with his/her lecturers such as adding materials, sending homework, notes or announcements, forums, resources or references, course syllabus/schedule, and report about the details of grades to students. The student can view all Information that sent to him/her by the lecturers and download the materials or submitted homework/assignment in due date from anywhere via the internet by logon onto the system.

2.1.2 Observation

Through observation found many students and lecturers need to find management system in order to manage courses information. Currently not found any system to help the lecturers for the purpose of communication and interaction between the students every day by sending a lot of information that associated with the study, for example, sent lectures, sent homework's, sent announcements, sent references, sent forums, etc. via the internet through management system. Also to help students to download and view the information which sent to them by lecturers, and enables them to send daily. The problem started, when observed a large number of students cannot come to the university every day and not found any suitable way to communicate and follow-up the tasks of study every day because of the bad situation that the country suffer from it now after the war 2003.

2.1.3 Interview

Based on the interview (put sample questions to the users) that conducted among a group of students, lecturers and university administrators which confirmed that the university needs a new system to help them to manage the requirements of students with regard to the communication, interaction and follow-up the study tasks between the students and lecturers. The result from respondent that confirm need to have e-courses management system (eCMS) shown in table below.

Table 1: The respondent result for eCMS during interview

Percentage %	Comment
85	Agree to have e-courses management system (eCMS) which includes user (student, lecturer, and manager) information, user account information, and courses study information.
15	Disagree to use any computerized system to handle the course management problem.

2.2 Analyze Requirement Phase

2.2.1 Requirement

Requirement analysis is the activity of determining and specifying customers' needs. It includes parleying between developers and users or customers. According to Whitten et al. [7], requirements include two main types, functional requirements and non-functional requirements. Whitten et al. [7] describes the functional requirements, a prescribing of services and activities that a system must provide. Non-functional requirements describe properties the system must have, such as performance, availability, accessibility and ease of use [2].

2.2.1.1 Functional Requirement

The table 2 shows the list of functional requirement for eCMS.

Table 2: list of functional requirement

No.	Use Case Name	Requirement ID	Requirement Description	Priority
	Login	eCMS _01		
1.		eCMS _01_001	To authenticate user (the user must enter validate his/her user ID and password).	M
		eCMS _01_002	To inform invalid password and user ID	D
	Manage Profile	eCMS _02		
2.		eCMS _02_001	The user can update his/her profile	O
		eCMS _02_002	The user can view his/her profile	O
		eCMS _02_003	The user can view specific user profile	O
	Manage Account	eCMS _03		
3.		eCMS _03_001	Create new account.	M
		eCMS _03_002	Delete exist account.	D
		eCMS _03_003	Update exist account	D
		eCMS _03_004	view details of account	O
	Manage College Courses	eCMS _04		
4.		eCMS _04_001	Add course to lecturer courses.	M
		eCMS _04_002	Delete course from lecturer courses.	D
		eCMS _04_003	Update course	D
		eCMS _04_004	view details of course	O
		eCMS _04_005	View course profile of students	O
		eCMS _04_006	view course syllabus/schedule	O
	Manage Course	eCMS _05		

5.		eCMS _05_001	Send materials (lectures and assignments) to the students	D
		eCMS _05_002	Delete materials	O
		eCMS _05_003	Send references to the students	D
		eCMS _05_004	Send forums to the students	O
		eCMS _05_005	Send announcements to the students	D
		eCMS _05_006	View course profile of students	O
	Manage Assignments Solutions	eCMS _06		
6.		eCMS _06_001	Download assignments solutions that have sent by students.	M
	View Course Information	eCMS _07		
7.		eCMS _07_001	Student can download materials (lectures and assignments) that have sent by lecturer.	M
		eCMS _07_002	View references that have sent by lecturer.	D
		eCMS _07_003	View forums that have sent by lecturer.	O
		eCMS _07_004	View announcements that have sent by lecturer.	M
		eCMS _07_005	View grade details that have sent by lecturer.	
		eCMS _07_006	View lecturer profile	O
		eCMS _07_007	view course syllabus/schedule	O
	Submit Assignments	eCMS _08		
8.		eCMS _08_001	Upload assignments solutions to the lecturer	M
	Log Out	eCMS _09		
9.		eCMS _09_001	The user make log out of the system	D

In the priority column, the following short hands are used: M – Mandatory requirements (something the system must do), D – desirable requirements (something the system preferably should do), O – optional requirements (something the system may do)

2.2.1.2 Non-functional Requirement

The table 3 shows the list of non-functional requirement for eCMS.

Table 3: list of non-functional requirement

No.	Use Case Name	Requirement ID	Requirement Description	Priority
	Usability issues	eCMS _10		
10.		eCMS _10_001	The system must provide the easy access.	M
		eCMS _10_002	The system must be easy to deal with.	M
	Understandability issues	eCMS _11		
11.		eCMS _11_001	The system should be easy to understand	M
	Operational issues	eCMS _12		
12.		eCMS _12_001	The system will have server for the database and connection to the main database.	M
		eCMS _12_002	The system will work over the web environment with all web browsers.	M
		eCMS _12_003	The system must be current with evolving web standard.	M
	Performance issues	eCMS _13		
13.		eCMS _13_001	The system database must be updated in real time.	M
		eCMS _13_002	The system must have reasonable speed according to technology use to access many of users at the same time.	M
		eCMS _13_003	The system should be available 24x7.	M
	Security issues	eCMS _14		
14.		eCMS	Only the person who has user	M

		_14_001	name and password can access the system.	
		eCMS _14_002	Unauthorized person should not use the system, just view the main page.	M
		eCMS _14_003	No one can change the password without login to the system.	M

2.2.2 Constructed Requirement Model For eCMS

All requirements should be documented and recorded by using an effective way or technique to model out the requirement and to understand all system requirements. This technique calls requirement model. According to Compton and Huggins [9], a requirement model describes the functionality of a software system. Many tools have been used in analysis and design of programs and this UML has emerged as a standard technique in object oriented approach [10]. In this study, the unified modeling language (UML) is used as a tool to define as well as to construct the requirement model for eCMS. The following diagrams and supporting textual information constitute the requirement model were stated as below:

2.2.2.1 Use Case Diagram

the use case diagram provides an easy and clear way to introduce the requirement structure in software system [11].The use case diagram for eCMS as shown in figure 2 consist of nine (9) use case involve to construct this requirement model which are login, manage profile, manage account, manage college courses, manage course, manage assignments solution, view course information, submit assignments, log out. The requirement model for eCMS has three actors which are:
(a) Manager: this person responsible for the main important activities such as manage user account (give account number to the user), manage college courses (give courses to the lecturers), and administration of the website of eCMS.
(b) Lecturer: this person responsible for the important activities that help to solve the problems of students such as manage course (sent material, deleted material, sent references, sent forums, send announcement...etc to the students),and manage assignments solutions(download assignments) that sent to him/her by the students.
(c)Student: the eCMS was built for the purpose of help to solve the problems which many students suffered from it. The activities of student such as view course information (download materials, view references, view forums and view announcements that sent to him/her by the lecturer, and also can view examination result and lecturer profile), and submit assignments (upload the assignments to the lecturer).

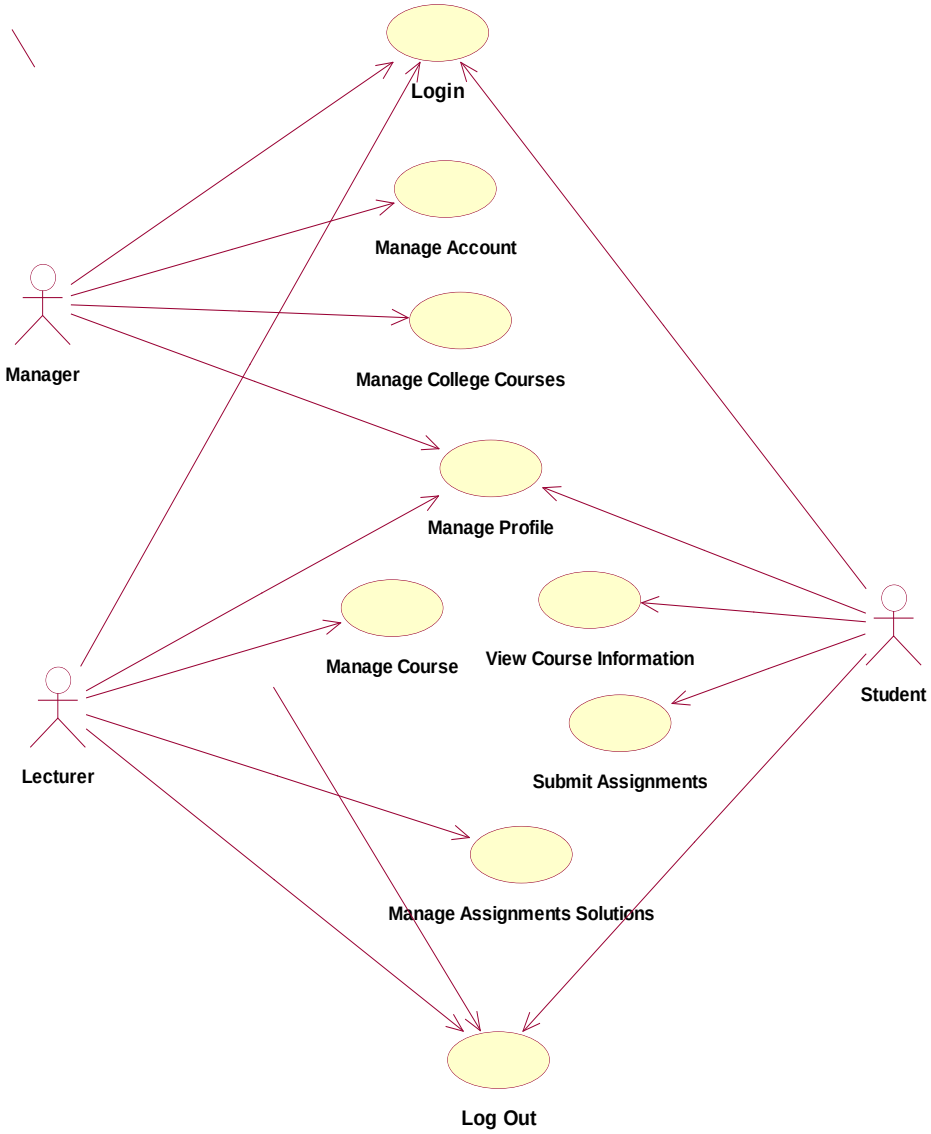


Figure 2: Use Case Diagram for eCMS

2.2.2.2 Use Case Specification

All use case will be define in this use case specification to provide the details of the functionality that the system will support and describe how the actors will use the system in order to obtain a specific result of value. Each use case specification for eCMS have six (6) fields, which are the brief description of use case , pre-conditions, characteristics of activation, flow of events that consists of basic flow, alternative flow and exceptional flow, post-conditions and rules. The system have nine(9) use cases but now no have enough space in order to describe all of it only take one use case in order to describe the analysis of this system such as use case (View course information). The Specification of this use case as follows:

- **Brief Description**

This use case is activated by student to access and view course information such as download materials (lectures and assignments), view references, view forums, view announcements, and view examinations results. The student can also view lecturer profile and view course syllabus/schedule.

- **Pre-Conditions**

The student already login to the system.

- **Characteristic of Activation**

Event Driven (on user's demand)

- **Flow of Events**

– **Basic Flow [eCMS _07_001]**

1. This use case begin after student successfully login onto the system
2. The systems verify the user ID and password and prompt the student manage this interface.
3. The student select <<View Course Information>> option,
4. The system will display view course information page
5. The student must select course name then click on <<Enter >> button.
6. The system will display course name page with all activities that related to course name.
7. the student select <<Download Materials>>option [A-1: View References] or [A-2: View Forums] or [A-3: View Announcements] or [A-4: View grades details] or [A-5: View Lecturer Profile] or [A-6: View Course syllabus/schedule]
8. The system will display download materials page with all materials information that sent to him/her by the lecturer that related to the course name and group name.
9. The student can view materials (documents) information or download it by click on <<Download>> button
10. The system will display materials information
11. The system will enable student to download/save documents onto local device.
12. The student can download more materials from the same course and/or different group name or from another course name by click on <<Select another course>> button.

– **Alternative Flow**

A-1: View References [eCMS _07_002]

1. The student select <<View References>> option
2. The system displays view references page with all previous references information which sent to him/her by the lecturer that related to the course name and group name.
3. The student enables to view references information to another course name by click on <<Select another course>> button.

A-2: View Forums [eCMS _07_003]

1. The student select <<View Forums>> option
2. The system displays view forums page with all previous forums information which sent to him/her by the lecturer that related to the course name and group name.
3. The student enables to view forums information to another course name by click on <<Select another course>> button.

A-3: View Announcements [eCMS _07_004]

1. The student select <<View Announcements >> option
2. The system displays view announcements page with all previous announcements information which sent to him/her by the lecturer that related to the course name and group name.
3. The student enables to view announcements information to another course name by click on <<Select another course>> button.

A-4: View Grade Details [eCMS _07_005]

1. The student select <<View Grade Details >> option
2. The system displays view grade page with information about grades to all students that related to the course name and group name.
3. The student enables to view grade information to another course name by click on <<Select another course>> button.

A-5: View Lecturer Profile [eCMS _07_006]

1. The student select <<View lecture profile>> option,
2. The system will display view lecture profile page with all information of lecturer profile.

A-6: View Course Syllabus/ Schedule [eCMS _07_007]

1. The student select <<View Course syllabus/schedule>> option,
2. The system will display course syllabus information that related to the course name and group name.

– **Exceptional Flow**

Not applicable.

• **Post-Conditions**

The system downloaded materials that have sent by lecturers to the students and saved it onto the local device.

Rule(S): Not applicable.

2.2.2.3 Interaction Diagram

Interaction diagram describe how the groups of objects can be collaborated in some behavior by displaying a message passed between them.This diagram contains two types of diagrams sequence diagram and collaboration diagram that were construct for each use case. In this system constructed fourty four (44) sequence diagram and also the same number for collaboration diagram. In other word, in this study the total number of interaction diagrams to this system was (88) diagrams. Figures below show some interaction diagrams for this system.

The boundary object, representing the user interface is: UI. The control object is: MGR and entities are: tables

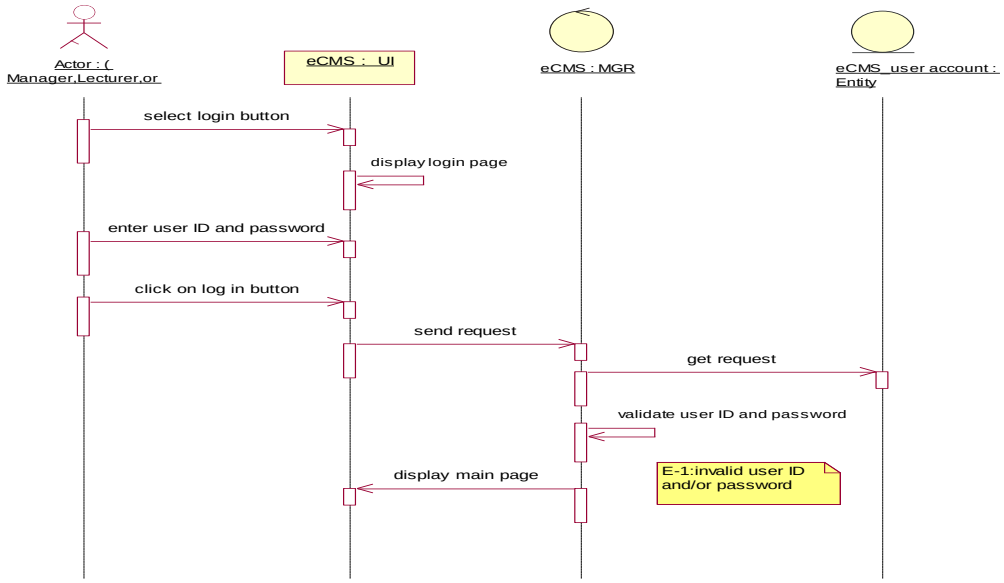


Figure 3: Sequence Diagram for Use Case Login [eCMS_01_001]

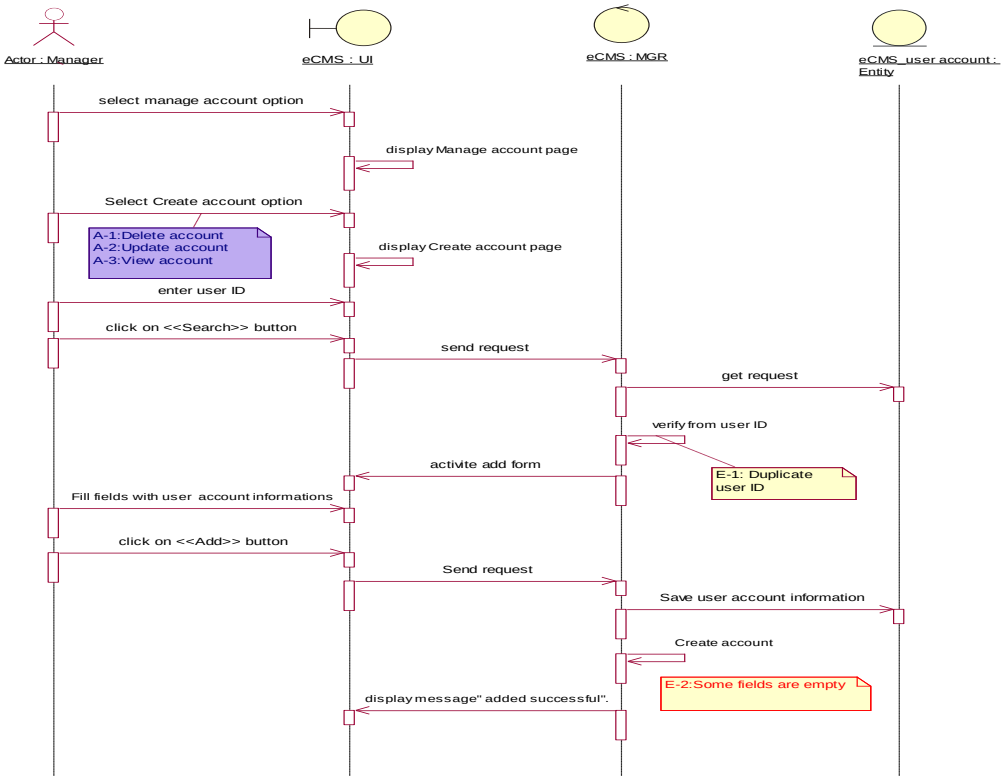


Figure 4: Sequence Diagrams for Use Case Manage Account_Create Account [eCMS_03_001]

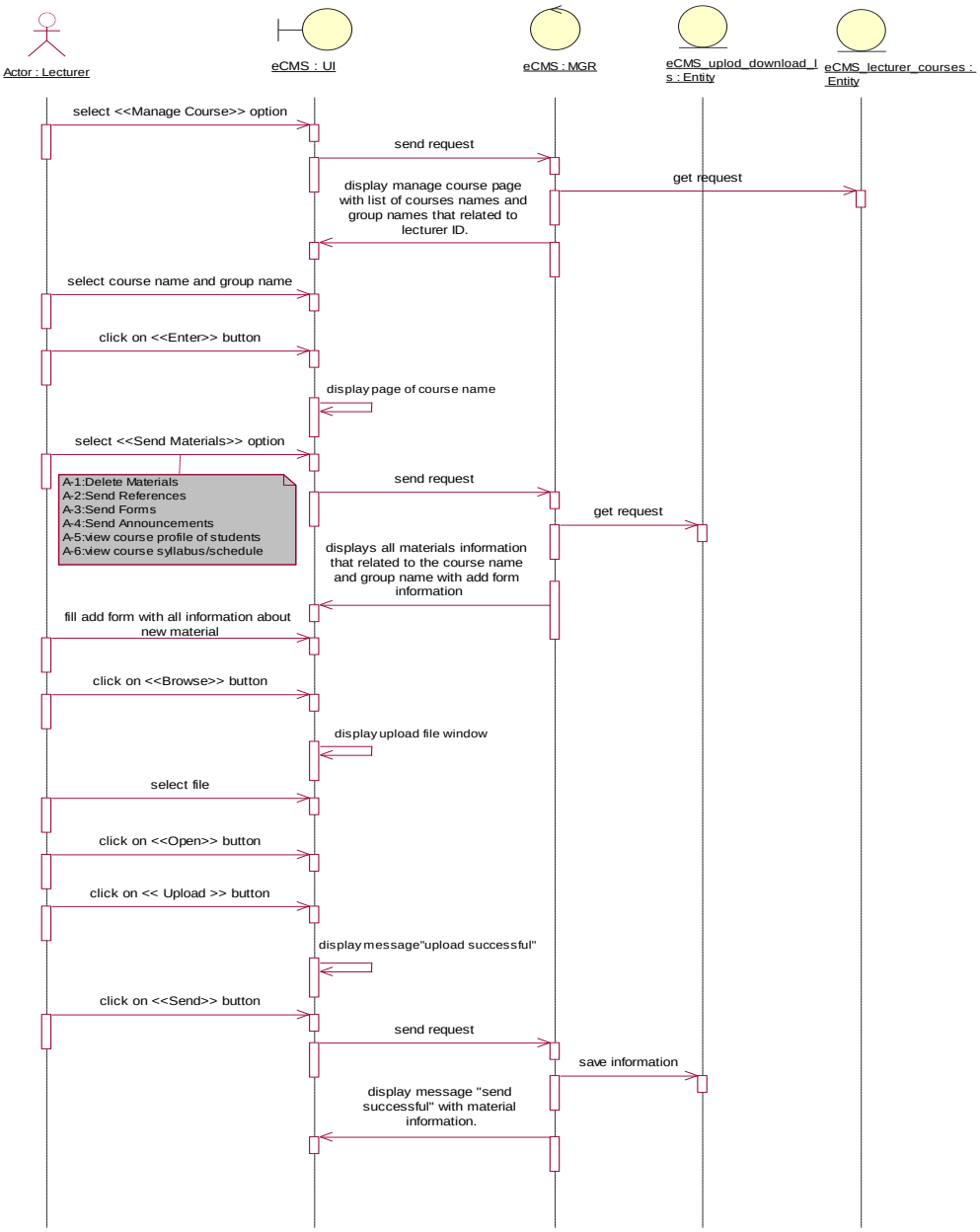


Figure 5: Sequence Diagrams for Use Case Manage Course_Send Materials [eCMS_05_001]

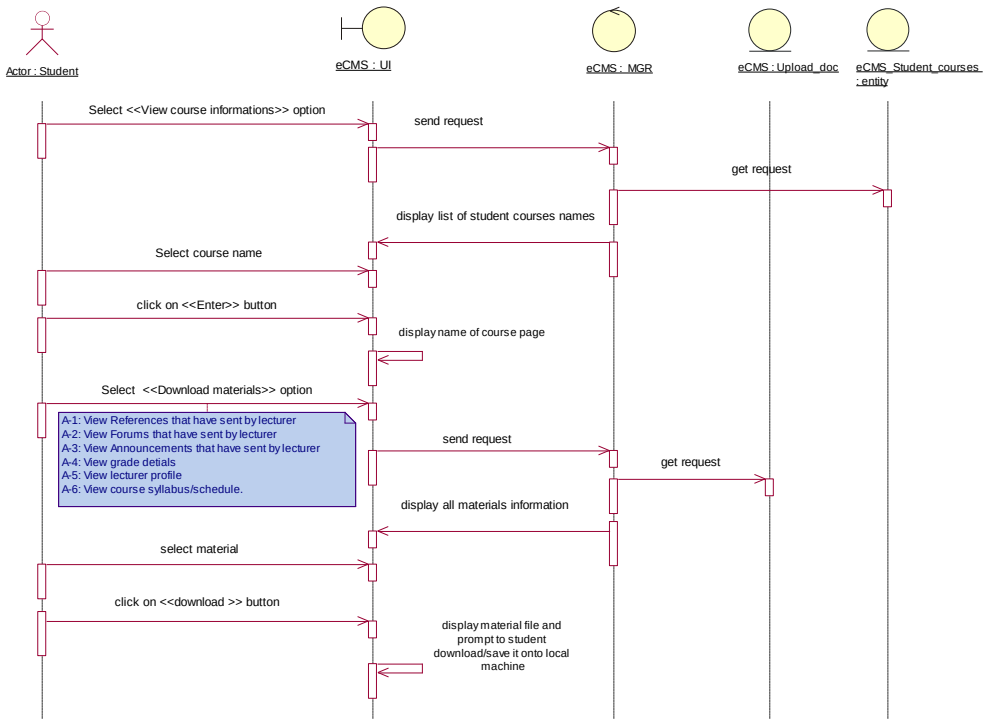


Figure 6: Sequence Diagram for View Course Information (eCMS _07_001)

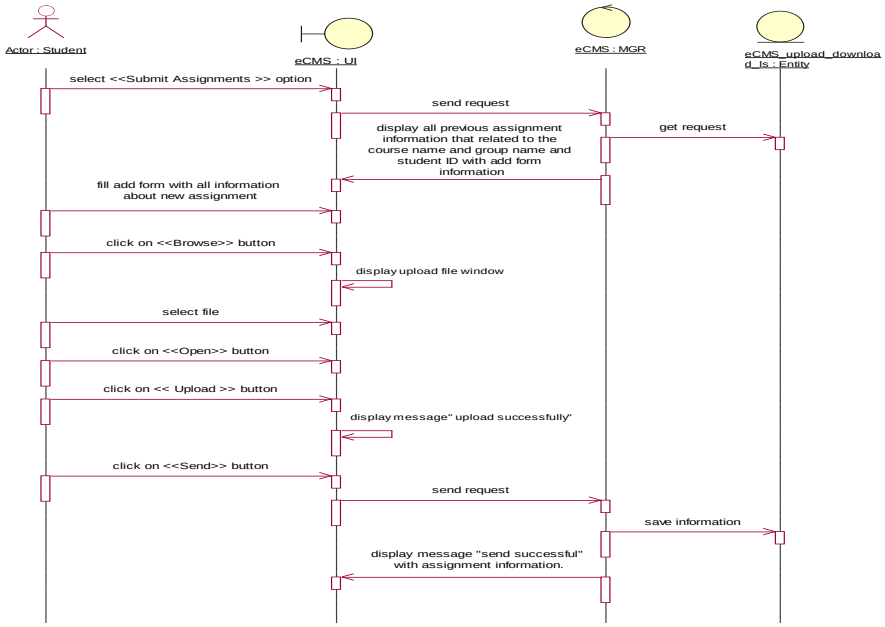


Figure 7: Sequence Diagrams for Use Case Submit Assignments [eCMS_08_001]

Collaboration diagram is the same as sequence diagram, but each diagram expresses information with a different view. It shows interaction between objects in terms of links between the objects.

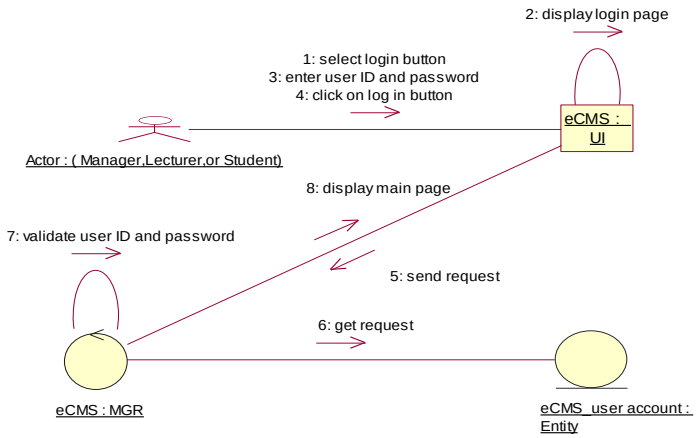


Figure 8: Collaboration diagram: Log in [eCMS_01_001]

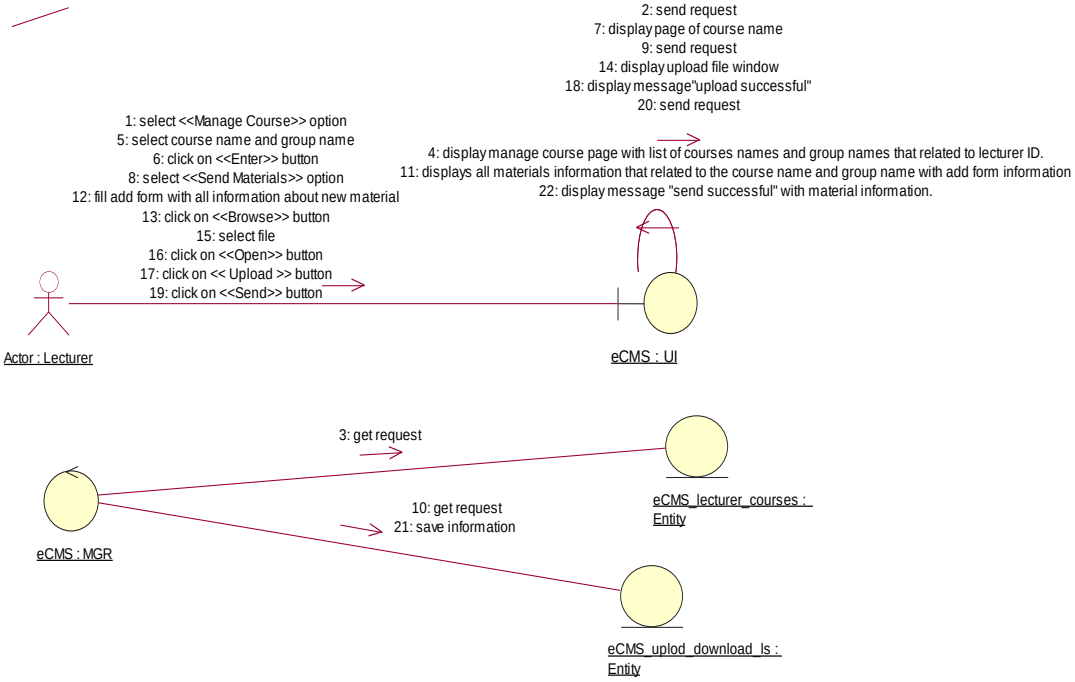
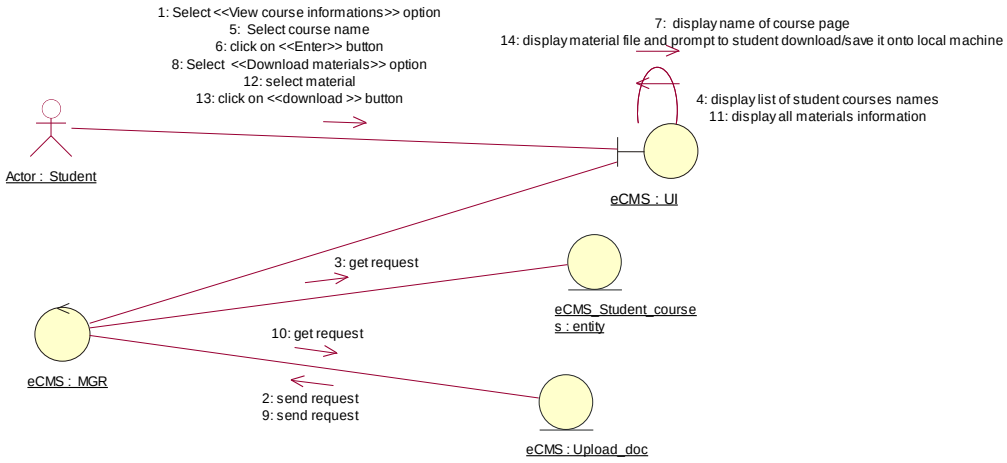


Figure 9: Collaboration diagram for Use Case Manage Course_Send Materials [eCMS_05_001]



10: Collaboration diagram for Use Case view Course information [eCMS_06_001]

2.2.2.4 Activity diagram

an activity diagram is logical models represent the business domains and operational activities without suggestion how they are conducted. Activity diagram contains nine (9) diagrams and constructed for all use case. In other word, each use case have activity diagram. Figures show the activity diagrams for some use cases of eCMS.

2.2.2.5 Class Diagram

Class diagram represents the ideas, things or concept that are included in the application. The class diagram contains eight (8) diagrams and construct depend on interaction diagram. This class diagram consists of boundary, controller and entity and shows the relations between them. Figure 17 shows the class diagram for eCMS.

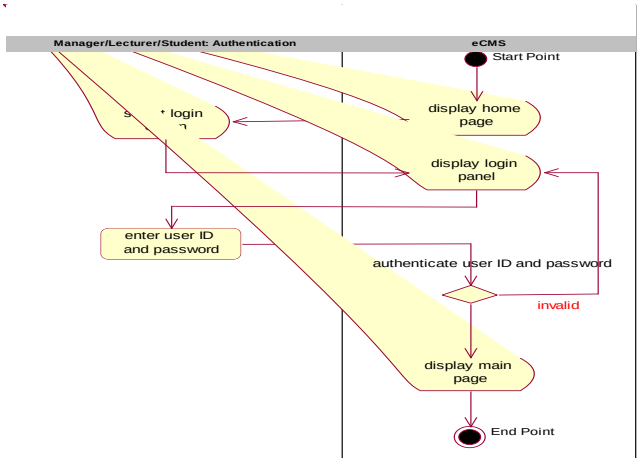


Figure 11: Activity Diagram for Use Case: Log in [eCMS_01]

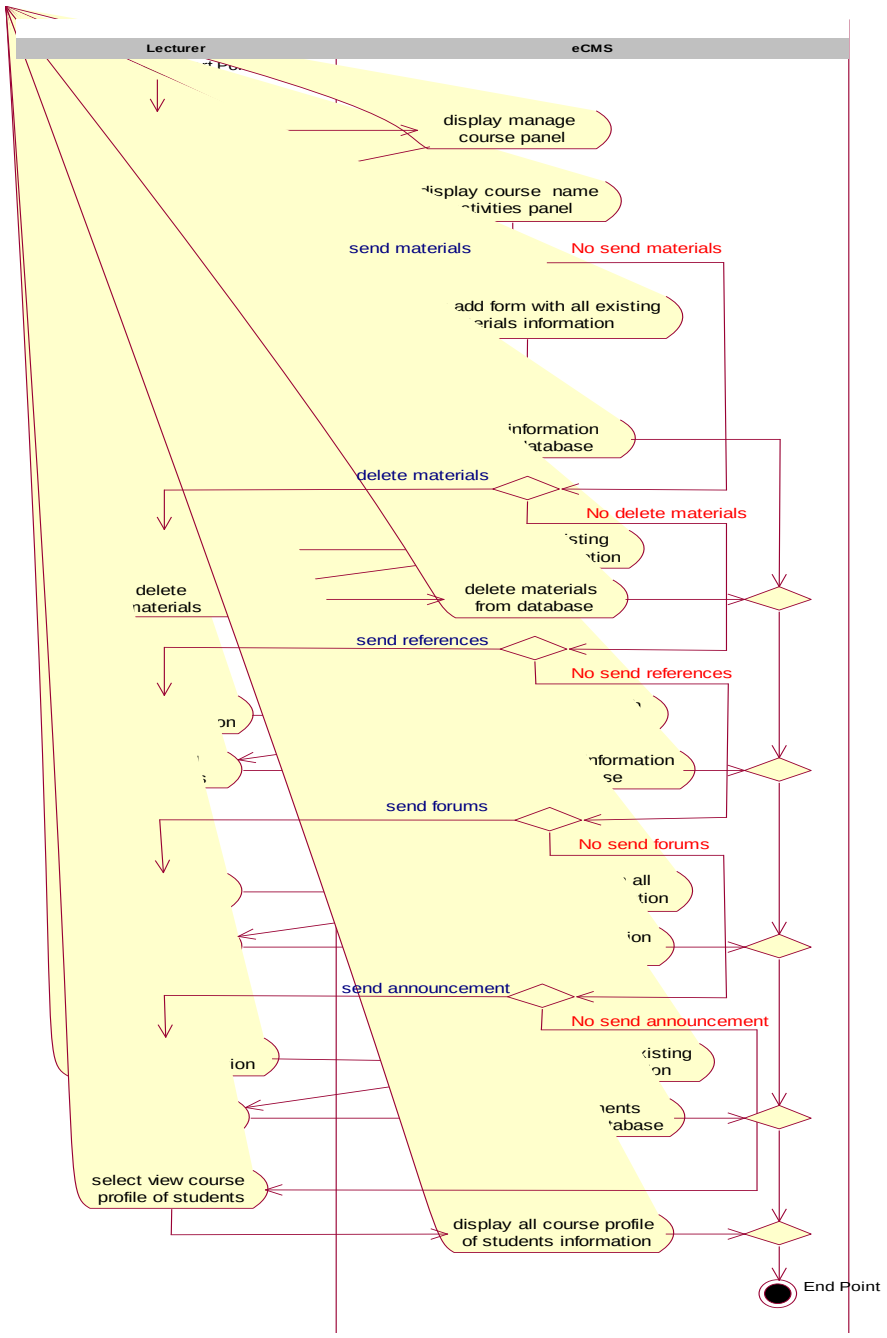


Figure 12: Activity Diagram for Use Case: Manage course [eCMS_05]

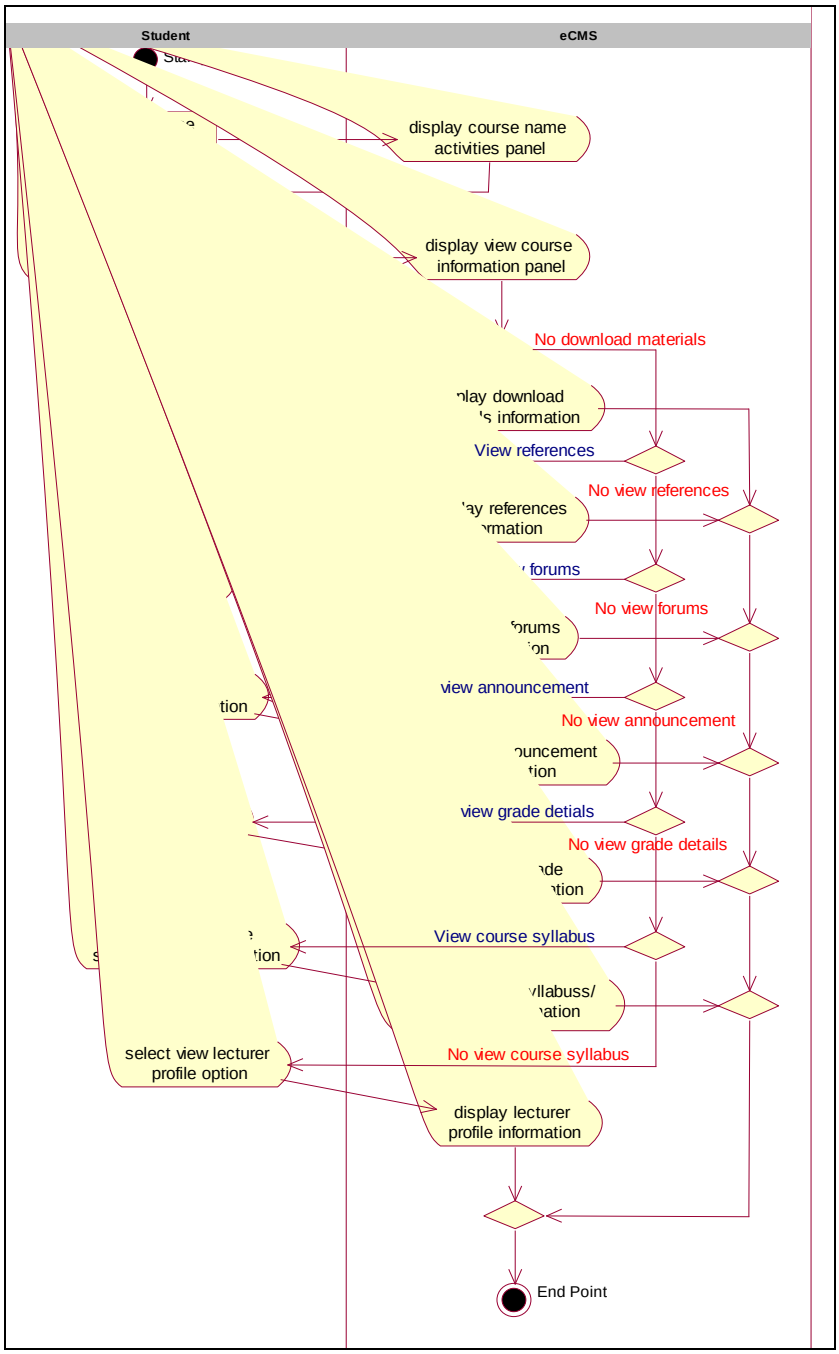


Figure 13: Activity Diagram for View Course Information

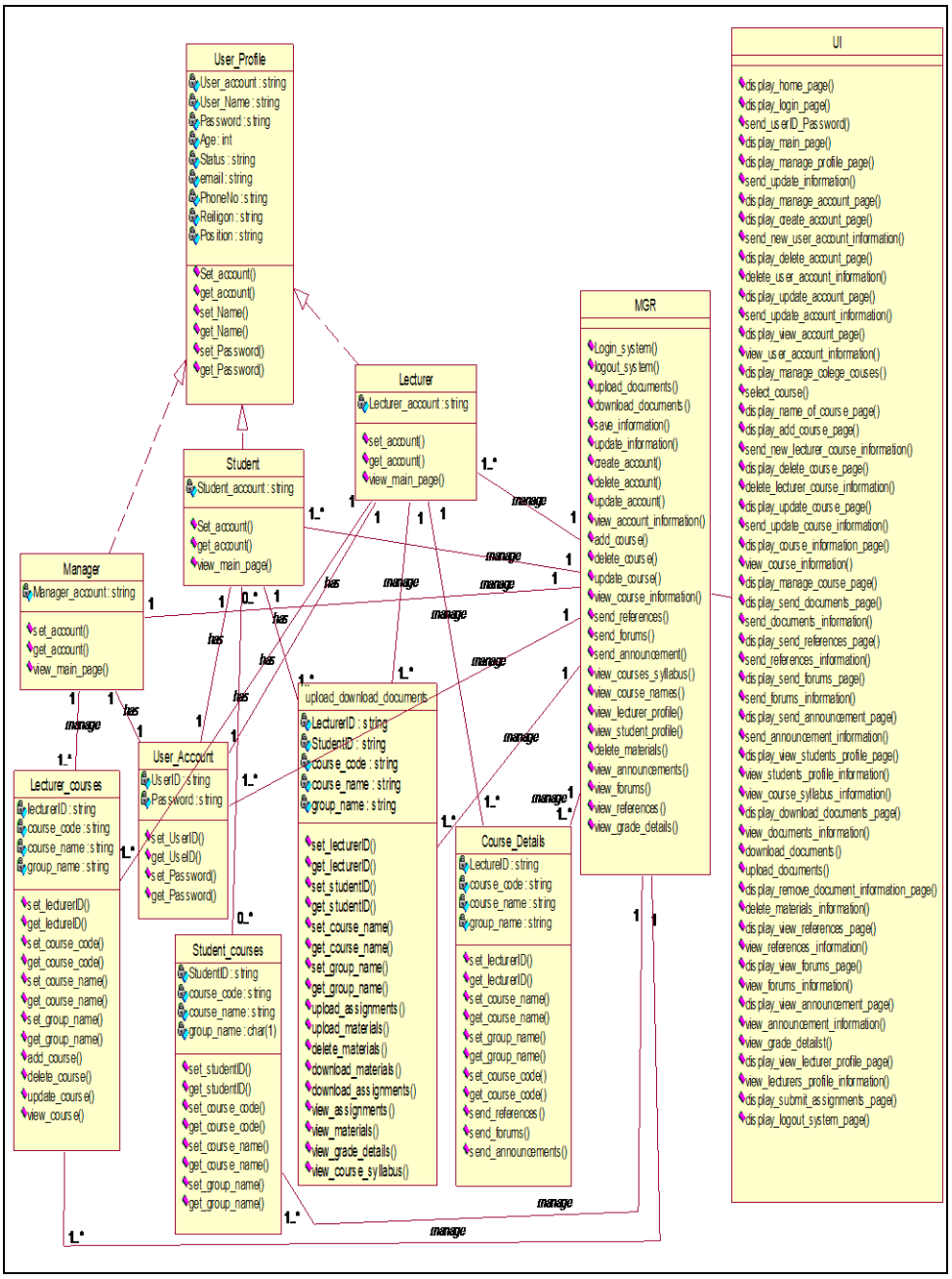


Figure 14: Class Diagram for eCMS

2.3 VALIDATION REQUIREMENT MODEL

The fourteen (14) real users at Thi-Qar University shown in table 2 were test the prototype depend on use case specification of this system in order to validate the functional requirements that are involved by using test script techniqe.

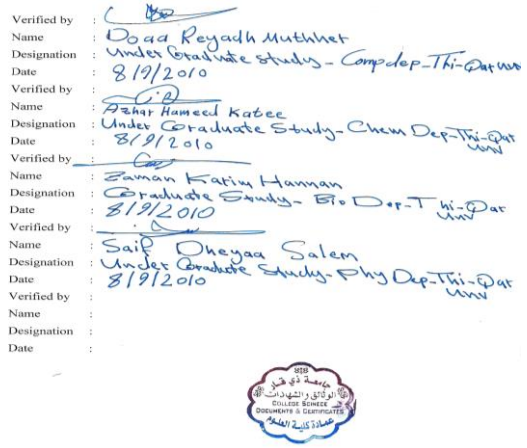
Table 2: Number of Functional Requirement Validation for eCMS

No. of user	Position	Number of validated requirement	Verification
5	Manager	28	Ok
5	Lecturers	16	Ok
4	Students	17	Ok

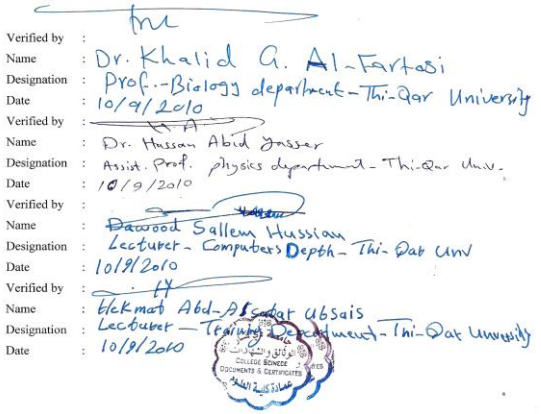
The test script for use case view course information as follow:

9.	**View Course Information**	Download materials [eCMS_03_001]	• The user select view course information option • The system displays list of courses names that associated with student ID • The user select course name and click on "Enter" button • The system displays course name activities panel • The user select download materials option. [A-1][A-2][A-3] [A-4][A-5] [A-6] • The system displays all materials information that have sent to him/her by the lecturer	ok
			• The user can view materials information or download it by click on "Download" button • The system displays material information and enables the user to save it onto local device. • The user can download more materials to the same course and group name or to another course name by click on "Select another course" button.	
10.		A-2:View References [eCMS_03_002]	• The user select view references option at course name activities panel • The system displays all references information that sent to him/her by the lecturer that related to the course name and group name. • The user can view the references information to another course name by click on "Select another course" button.	ok

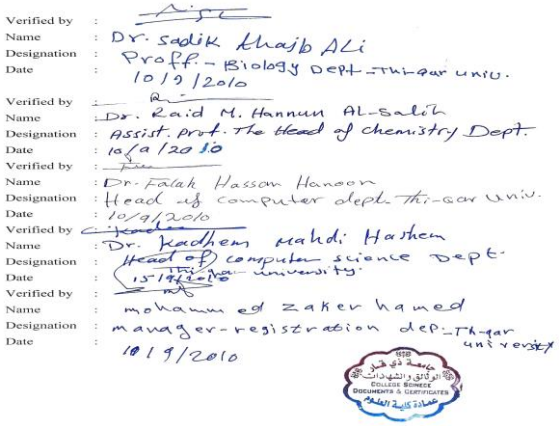
Actor: student



Actor: lecturer



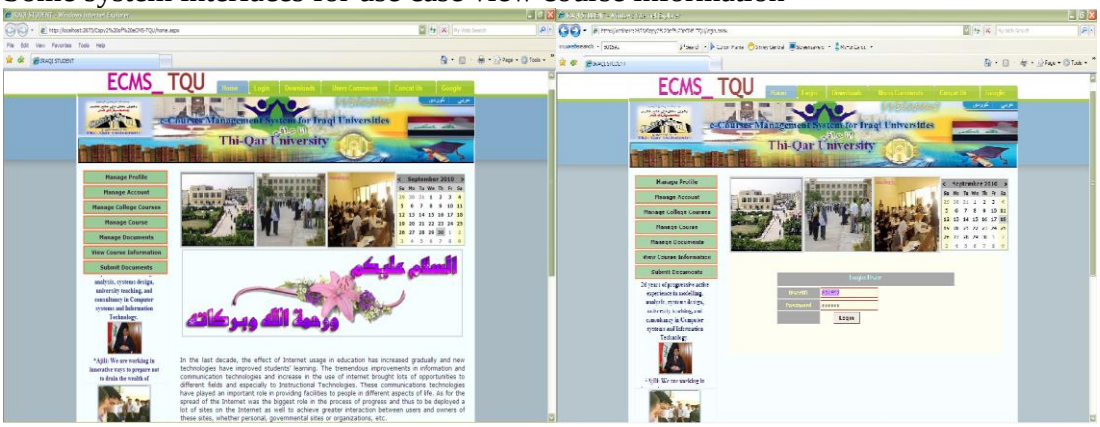
Actor: manager

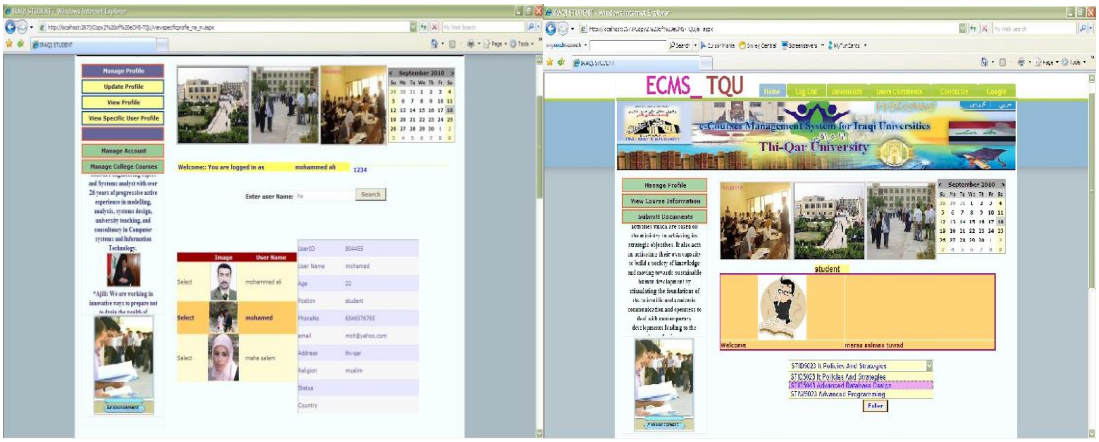


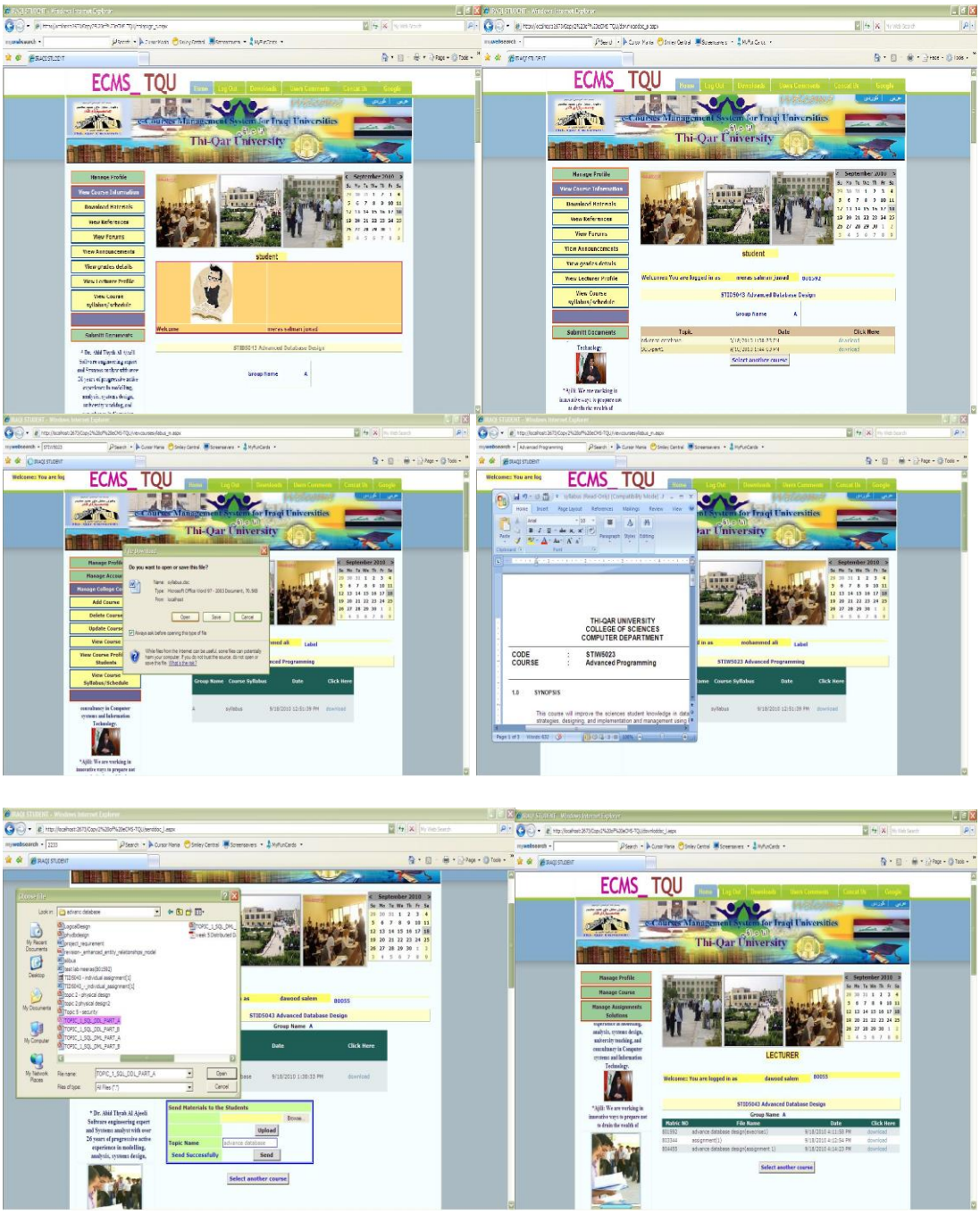
3. SAMPLE SYSTEM (PROTOTYPE)

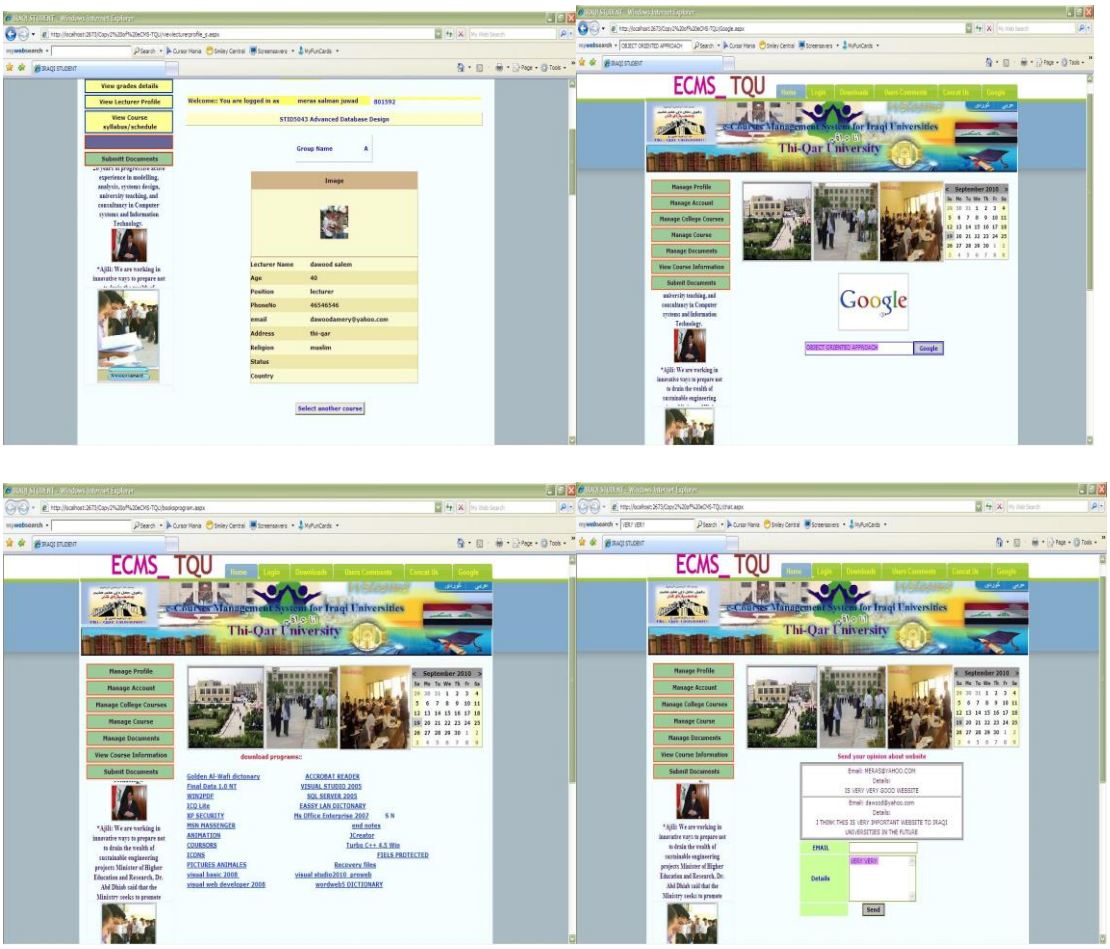
Sample system (prototype) was developed to support this validation phase and to show the user interface as a guide to verify the test script technique. As a result, the sample system (prototype) shows that all requirements has been fulfilled and were needed in eCMS by all the actors involved.

Some system interfaces for use case view course information






ECMS_TQU
Thi-Qar University
THI-QAR UNIVERSITY
COLLEGE OF SCIENCES
COMPUTER DEPARTMENT
CODE : STIW5023
COURSE : Advanced Programming
LECTURER



4. CONCLUSION AND RECOMMENDATION

This study was successfully achieve the objectives of requirement model. furthermore, this model will provide the greatest service to educational organizations and individuals with minimal amount of effrot. As a result, the model produced in this project is suitable for educational organization interested in managing their needs in a proper way. This study on constructing a requirement model for eCMS only focused on course activities subject such as the interaction and communication between lecturers and students. Therefore, findings of this study only limited on one subject only. It is recommended that future study should include some other subject such as students registration management, portal management activities and other related subjects. It is also suggested that a complete requirement model for eCMS that includes non-functional requirements should be provided in order to measure the model functionalities and performances by the future researcher. The future work may be able to carry out a full implementation of eCMS and include other universities to capture the requirements in order to make it reliable and standardize.

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