Design and Implementation of Electronic Learning System for Duhok Polytechnic University

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ABSTRACT

Nowadays, the Information and Communication Technology (ICT) made deep effects in the human life. But still the communication style in most Kurdistan-Region Government sectors is still at the beginning steps. So, the trend is to move towards the E-government system in order to overcome the problems of traditional style. E-university is a field belongs to the E-government. Hence, electronic learning is an important direction within E-university. This direction treats with learning-style and the communications between the academic-staff in one side and students in other side at the universities and keep-tracking their activities during studying-year. The current style of communication needs to be improved by benefiting from the new technology capabilities. However, the universities of Kurdistan Region suffer from lack of using new technology and building the E-university system will push other whole sectors towards the E-government system. As an important direction within Electronic Duhok Polytechnic University (E-DPU), this thesis produces an efficient proposed learning system called Duhok Polytechnic University Electronic Learning System (DPU-ELS). The proposed system serves to: DPU presidency, four colleges and eight institutions belong DPU. The proposed system consists of nine modules that provide four groups of services. First group relates with student services: Lecturers Feedback, Discussion Forums and Course materials that include: Lectures, Assignments, Schedules, Marks and Objections. Second group relates with department services: Academic Staff Authentication, Clearance and Summer Training. Third group relates with Lecturer: Preparing Course Materials and Discussion Forums. And fourth group relates with institution and university services: Exam Committee, Quality Assurance, Curriculum and Statistics.There are two different study-systems at DPU, two years for institutes and four years for colleges. So, the proposed DPU-ELS is designed according to the structure of DPU. These two different studying systems are depended just at polytechnic universities. The proposed system is implemented and tested practically for six institutions located at three different campuses: Duhok, Zakho and Shekhan. The students and staff of the selected institutions participated with implementation and obtaining the results that been evaluated by using System Usability Scale (SUS). The evaluation score of the questionnaire is (71.82%) which can be considered as a good percentage. Another step towards the E-government is the ability of copying this system at any other Kurdistan university. The proposed system has been designed and implemented using the tools: (MySQL, HTML, CSS, PHP, JavaScript, JQuery, Ajax and Bootstrap).

KEYWORDS : E-Government, E-University, E-Learning, Course Materials.

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1.1 INTRODUCTION

Colleges and institutes are required to respond to the development of Information and Communication Technology (ICT), especially after the Internet has been became fast and everybody have opportunity to benefit from this facility. Students become more familiar to use

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this useful technology after the revolution of social media in last decade. Hence, the use of Electronic learning (E-learning) term is more adequate and applicable to be used in universities and institutes that provide great opportunities for learner and educator to acquire knowledge and improve skills [1]. Day by day, E-learning in higher education become more suitable and needed for teaching from using email to forum discussion to distance learning. The definition of E-learning has different meanings from different people perspectives. So, E-learning is a set of applications and processes such as online learning, computer-based learning, distance learning. E-learning contains the delivery of information by: Internet, Extranet, and Intranet (WAN/LAN), computer-based, audio, video, satellite and TV. E-learning can be used by students for reviewing course materials, forum discussion, lecturer assessment, exams date, publishing marks without reduction of face-to-face class time. So, E-learning here is optional and just for helping students to improve their skills and help them for better understanding. In contrary to this, E-learning can be defined as delivering the whole course fully online without having any possibility of face-to-face class. Also E-learning can be defined as mix between online and attending class by delivering part of the course online which means partially online course [2]. In recent years, the Internet became huge and widespread use in daily human life, which includes the network of millions of connected computers identified by Internet address around the world. So that, after this wide evolution of World Wide Web (WWW), the design and implementation of E-learning become more useful and applicable to be implemented in: universities, institutes, elementary and secondary schools, corporations, public and private sectors. E-learning can be defined as a tool to share, discuss and exchange knowledge with overcoming to the barriers of time and distance for learner and educator, give them opportunities to learn faster and understanding better[3] [4]. E-learning is the reuse of information and can be presented in different forms such as: text, sound, video, pictures and animation. E-learning information can be stored for long period of time in various formats. This information is accessible by the students without regard of time and place. So, it gives them more opportunities to review course contents more than one time in the day. Hence, it helps learner to exploit and improve his own knowledge in very short period of time as much as they want without stress of time and place discipline [5]. The scope of this thesis is to provide an electronic learning system with focusing on student side (downloading lectures, assignments, exams result and lectures timetable, uploading the assignments, participating in related forums, browsing his marks, returning lecturers-feedbacks, submitting objections). Also, focusing on lecture side (uploading lectures and assignments, receiving solved assignments, participating in related forums, downloading exams and lectures timetable, and submitting assessment reports). In other direction, the proposed system scopes on: managing the mechanism of learning tasks electronically through the presidency, institution scientific affairs units and institution departments. Finally, the scope of this thesis deals with providing full statistical calculations related with the learning system electronically with full flexibility. Due to the complex routine of the traditional learning style depended in Kurdistan universities, this system has been proposed as a necessary step towards an efficient system to be applied at this field. The thesis motivation can be summarized by making the DPU to be electronic university by all its directions: Learning, Student Affairs and Human Resource Management. The resultant system will push other universities to apply such electronic systems to pass big steps towards technology field. As a result of these applications, certainly the Kurdistan Region (KR) will go towards the E-government which is the demand of all citizens. In 2010, Ghoniemy, Fahmy and et al. [6] proposed a prototype for a simple, dedicated, learner-oriented E-learning system to facilitate the learning process. The system enabled the student to navigate through the system accessed scientific material available there. After the students registered to the system they could follow course activities, collaborative with other students, discuss with tutor, download lectures and assignments, carry out self-tests and join exams. Also, Sharable Content Object Reference Model (SCORM) applied to the course content produces small, reusable E-learning objects. The proposed system allowed guest (including general users and students) to navigate freely within the site. They could view the departments of each college, the courses of each department and they could view the tutors of specific course in addition to course description. The proposed web based E-learning system developed using Microsoft Active Server Pages (ASP.NET) technology and could be used in any network based on a windows server. Database was created with SQL Server 2000 application. However this work (i.e. [9]) addressed thirteen job-types which are: (lecture, course, tutorials, assignment, quiz and project) as part one, (discussion, examples, eBooks and video) as part two called Additional resources, and (midterm exam, final exam and examination) as third part called Assessment. Hence, when comparing with the proposed DPU-ELS it can be observed that part one of [9] is equivalent to just two modules which are: Student and Lecturer modules. The second part is just external links to the resources sites related with both of Students and Lecturer modules, and not additional modules. Finally third part is equivalent to the Exam committee module. So, just three modules of the proposed DPU-ELS have been addressed in [9] and there are other six modules not addressed. In 2011, Ractham and Firpo [7] proved that it could be conclude social networking technology in learning process such as Facebook as a supplement to a college-level course to better help students share and generate knowledge. It presented that instructors and students use the wall to communicate with each other. Students could share knowledge among each other by sharing their answers to the discussion assignments, create educational quizzes and shared them with the rest of participants, and also could use private communication among themselves and instructors. As a result of evaluation; about 78% of students thought that the Facebook is useful in learning process and the 55% thought that the Facebook is helpful in learning and teaching. As mentioned before, the social networks such as Facebook could be helpful and useful in E-learning, but the main drawback was that, the university could not depend on Facebook as an official system. It just could be used for discussion and knowledge sharing. Hence it is impossible to keep data for long time to be used later for statistical purposes that can be done with DPU-ELS. In 2013, Saydam, Timms and et al.[8] Many K-12 and higher education institutions used and implemented the open source Modular Object Oriented Digital Learning Environment (Moodle). The LMS including Moodle in The University of New South Wales (UNSW) gave the educator the best tool to manage and support E-learning process. The Moodle activities include forum, databases and Wiki. It can be used as blended learning or full online learning. Moodle includes many features for students such as lists, the grade of tests and quizzes of each enrolled student, create groups for discuss course subjects, allowing upload and sharing lectures for classroom and update student profile. It could work on all major web browsers and support all available windows. From the existed approach experience the advanced implementation of Moodle is recommended in future. There is no doubt that the Moodle is one of the most famous LMS around the world, but the big and known drawback is that, it is difficult to customize the system according to university requirements. Hence, the proposed DPU-ELS is designed according to the requirements of DPU. Any additional demands (in future) can be added usefully that it costs money if provided by the Moodle. In 2014, Shafaat and Marbouti and et al. [9] Proposed Massive Open Online Course (MOOC) model to be re-used in blended learning, in order to have benefits for both instructors and students. In one of the classes in Purdue University in Robotics field concluded that the MOOC model similar to other massive educational systems had main problem in the interaction among students and instructors. Still this problem remained unsolved due to high number of enrolled students in one course. So the main purpose of the proposed model was to enable students to interact more with the course content, each other and course instructors by reusing MOOC model as a blended learning model. Instead of re-using Mooc model as blended learning that designed especially for full online course. Designing DPU-ELS for Polytechnic Universities and utilizing it as blended learning system provide better interaction for both instructors and leaners. In addition to that, there is no need for external staff when the system need maintenances and update.

1.2Instructional Design Model for E-learning

Depending on the model that can be considered as an instructional system design model consists of five phases: Analysis, Design, Development, Implementation and Evaluation will be called (ADDIE) model. This model can be applied to any form of E-learning such as blended learning, instructor-led E-learning, self-paced E-learning. Each phase in ADDIE model offers an opportunity for self-correction before moving to the next phase as illustrated in Figure (1-1). One of the features of this model can be understand and used in very simple manner. Usually, this cyclical model considered to be sequential and iterative. Sometimes, the phases of ADDIE model may be overlapped and interrelated. This model aims to save money and time by catching problems, while its phases are still easy to be fixed. It is very common and successful model, so most of the E-learning designers depend on it.

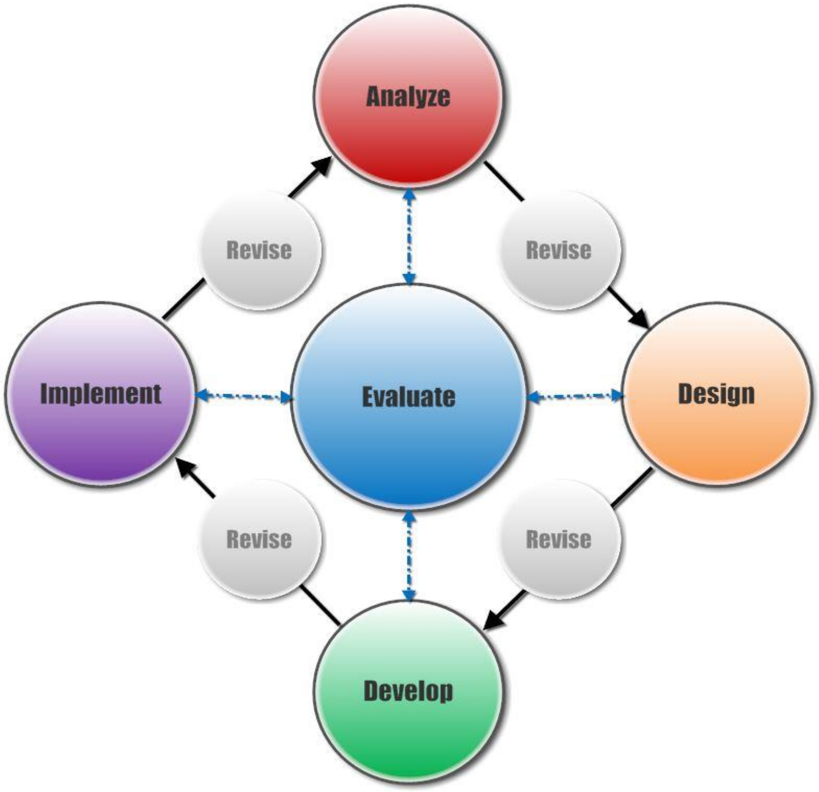

Figure (0.1) : Instructional Design Model for E-learning System

The phases of ADDIE model are [10] [11]:

- Analysis

In order to understand the infrastructure of the institution, this phase required data related to the design-process which collected by using questionnaires and interviews. Also, the identification of the problems, opportunities and outline the goals and objectives will be addressed in this phase.

- Design

After identifying the goals and objectives in the previous phase, it is necessary to start design and structure the system to meet and fit the learning course requirements. Also, the system design helps for defining overall system requirements.

- Development

The actual process of creating and developing the design of training materials and assessment materials stated here. The system is developed to address the performance gap existed in the analysis and design phases.

- Implementation

In the implementation phase, it is the time to decide how to intend to deliver course-content to the learners. The delivered process of the course is based on the analysis phase performance.

- Evaluation

This phase can be done for the previous phases; individually or all of them together. One of the evaluation strategies is using a combination of self-evaluation and learner-evaluation. Limitation and quality of the system will appear in this phase.

1.3 Learning Management System

For adapting an E-learning system, the design and implementation of LMS needed to get involved in E-learning for educating and training their own staff. LMS is aimed at managing an E-learning system for establishing the organization and delivery of teaching materials, managing and administrating resources, and tracking learning activities and results. However, the design and implementation of such system is not an easy task and construction need professional and specialist people. Many LMS are available such as: Moodle, Sakai and Blackboard including many useful features. These LMS purchased by the organizations and institutes for registration and online training courses but creating customized LMS is very important to meet most educators and learners requirements. The main roles of LMS are facilitate the consistency of delivery of course management, and provide the educational institution with powerful tools for curriculum development, communication between staff, collaboration, calendaring and task management automation.

1.4 System Requirements

During the design and implementation of the system, it is important to choose proper requirements for creating reliable, flexible, secure and low cost DPU-ELS. The

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system requirements can be categorized as: Functional Requirements, Non-functional Requirements and Software and Hardware Requirements. There are seven main types of functional requirements: Admins, curriculum development, department, quality assurance, lecturer, student, exam committee. Properties of the system related with the concepts of: Security, Reliability, Accessibility, Usability, Extensibility and Availability. The required software tools for this system are: Windows operating system, MySQL Database (phpMyadmin), HTML, PHP, Ajax and jQuery, CSS, Bootstrap, Web browser, and Internet service. Both of Server-side (one host) and Client-side (Internal and External hosts) are necessary as hardware implementation. Adding to that, there are necessary related peripheral devices for each unit such as: Scanners, Printers, Internet service provider.

1.5 Design of the DPU-ELS

The proposed DPU-ELS has been designed to provide important E-learning services at DPU. The proposed system constructed from nine main modules which are:

1. Student module.
2. Lecturer module.
3. Head of Department (HD) module.
4. Institution Exam Committee (IEC) module.
5. Institution Quality Assurance Admin (IQAA) module.
6. Institution Electronic Learning Admin (IELA) module.
7. University Curriculum Development Admin (UCDA) module.
8. University Quality Assurance Admin (UQAA) module.
9. University Electronic Learning Admin (UELA) module.

Figure (3.3) represents the structure of modules connections for the proposed DPU-ELS. The details of these interconnections among the above nine modules are illustrated in Figure (3.4).

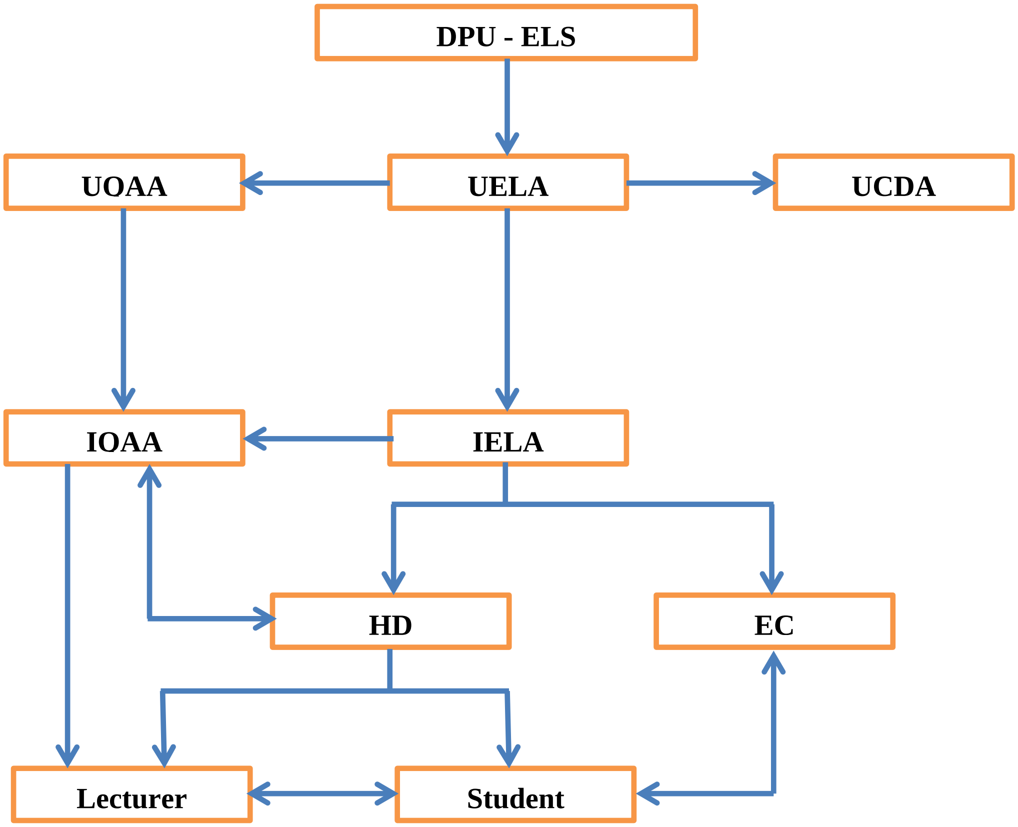

Figure (0.2) : Modules connection of DPU-ELS

1.6 Proposed DPU-ELS Systems

Each of the nine modules of the proposed DPU-ELS has special proposed algorithm and designed to provide the specific service related with that module. So, in this section we will brows flowcharts of just two modules. While the others will not be browsed in order to reduce number of pages.

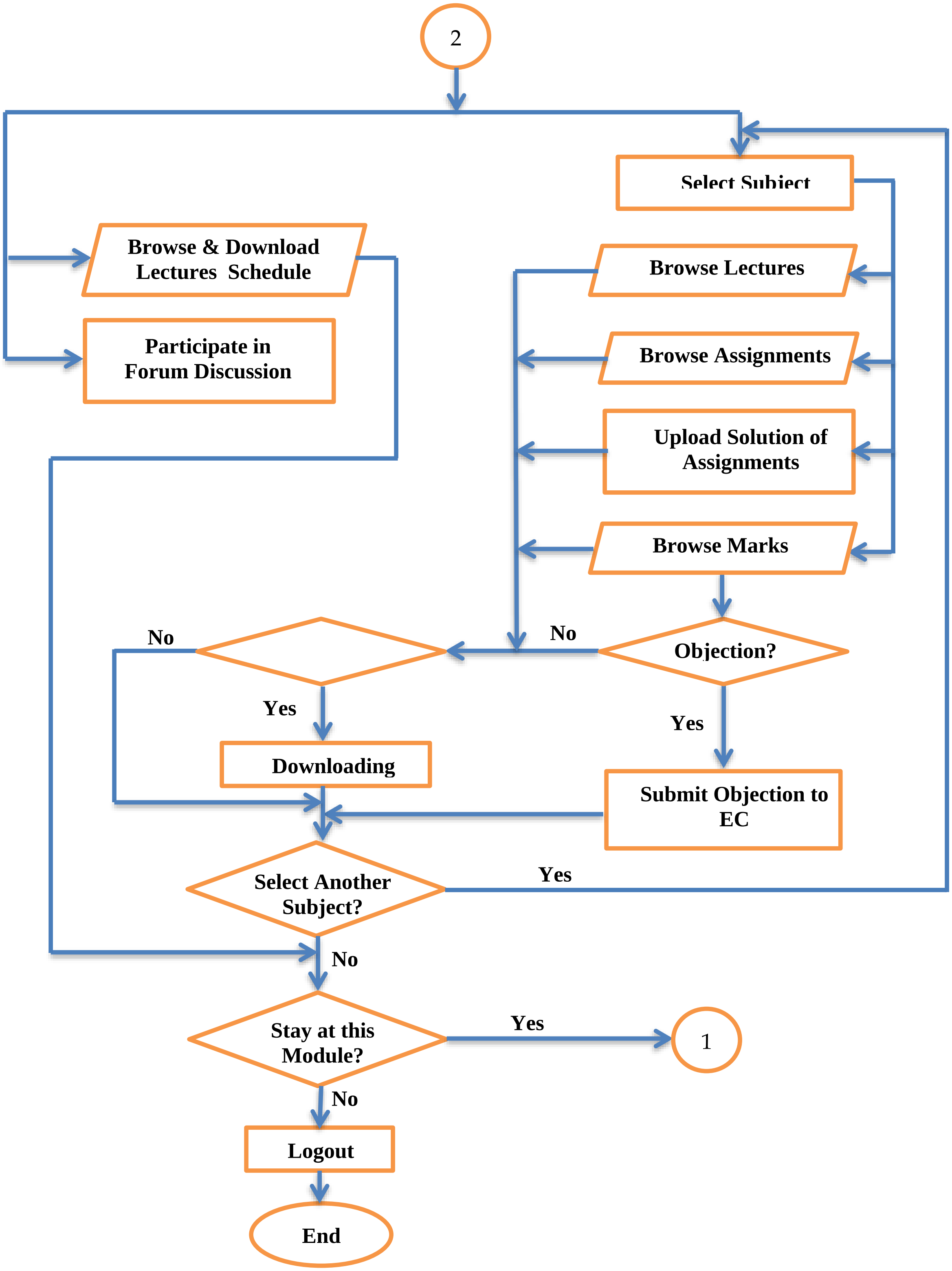
2
Select Subject
Browse & Download Lectures Schedule
Participate in Forum Discussion
Browse Lectures
Browse Assignments
Upload Solution of Assignments
Browse Marks
No
No
Objection?
Yes
Yes
Downloading
Submit Objection to EC
Select Another Subject?
Yes
No
Stay at this Module?
Yes
1
No
Logout
End

Figure 0.3) : Student dataflow diagram

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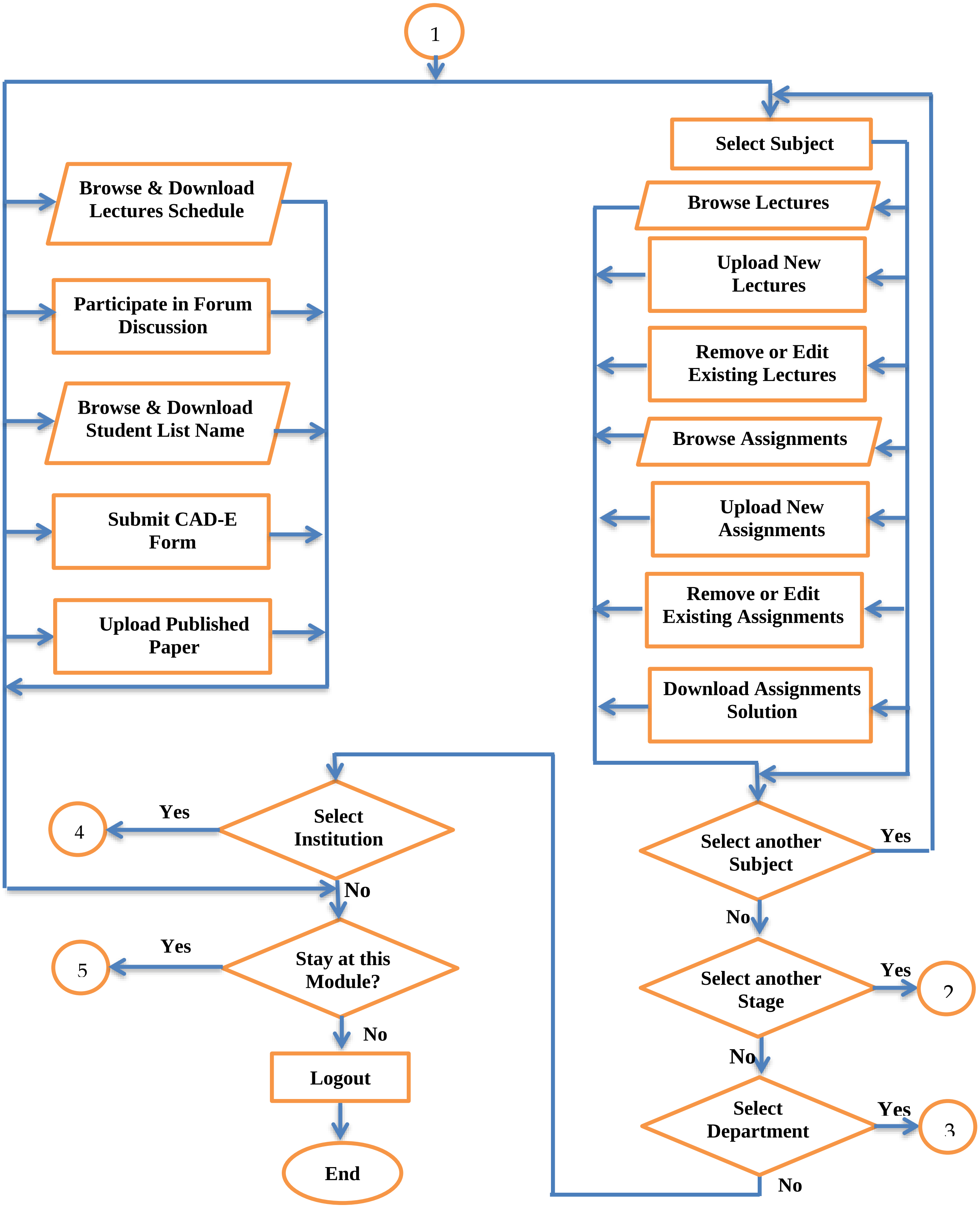
1
Select Subject
Browse & Download Lectures Schedule
Participate in Forum Discussion
Browse & Download Student List Name
Submit CAD-E Form
Upload Published Paper
Browse Lectures
Upload New Lectures
Remove or Edit Existing Lectures
Browse Assignments
Upload New Assignments
Remove or Edit Existing Assignments
Download Assignments Solution
Select Institution
Yes
4
No
Stay at this Module?
Yes
5
No
Logout
End
Select another Subject
Yes
No
Select another Stage
Yes
2
No
Select Department
Yes
3
No

Figure 0.4) : Lecturer dataflow diagram

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Implementation and Evaluation of DPU-ELS

1.7 DPU-ELS Main Page

Both of student and university staff (including admins and academic) can access DPU-ELS after correct login to system. Then, there will be two directions of entering the system: one for the students (college/institute) as shown in Figure (4.1) and the other for university staff as shown in Figure (4.2).

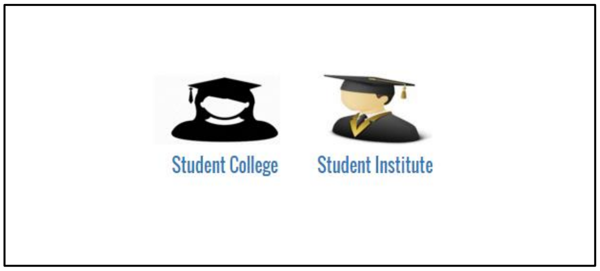
Student College
Student Institute

Figure 0.5) : Select page between colleges and institutes students

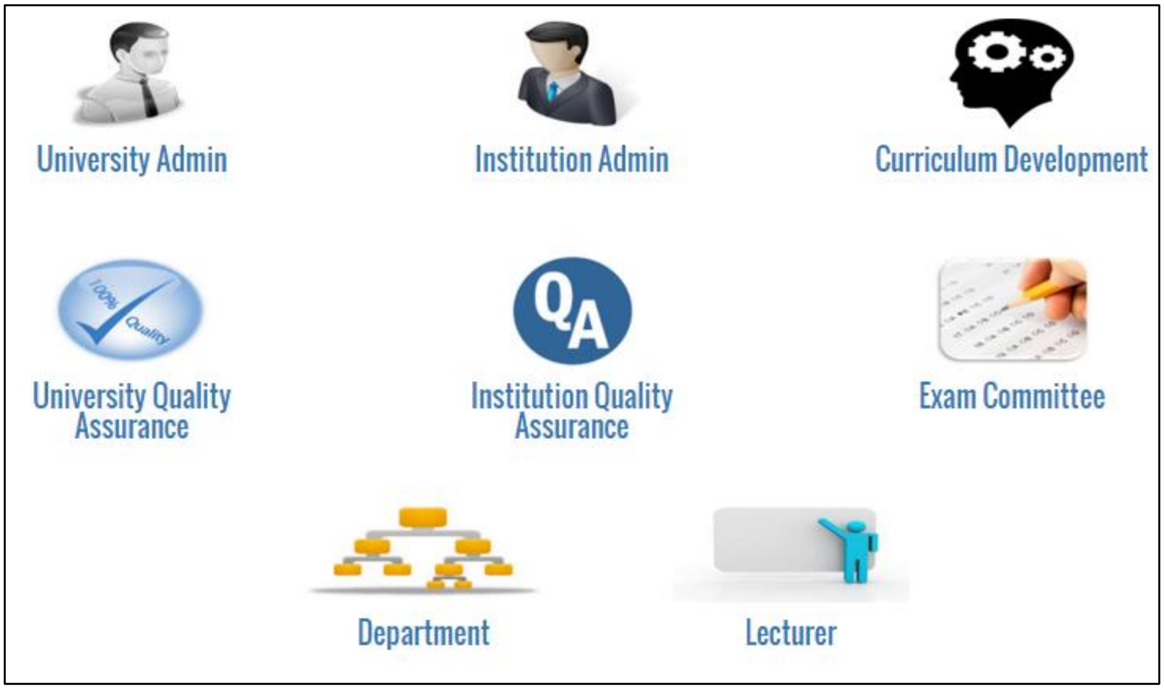
University Admin
Institution Admin
Curriculum Development
University Quality Assurance
Institution Quality Assurance
Exam Committee
Department
Lecturer

Figure (0.6) : DPU-ELS staff page

1.7.1 Student Panel

Student has the main role in DPU-ELS. So that, after the student gives correct user name and password and selects E-learning direction, the system will redirect student dynamically to student panel. This panel consists of two parts; college and institute depending on the study type at DPU as shown in Figure (4.1).

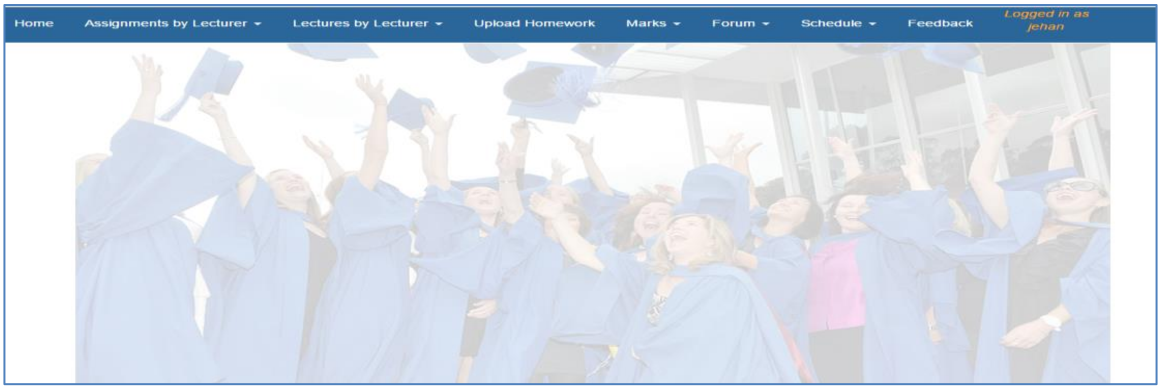
Home
Assignments by Lecturer
Lectures by Lecturer
Upload Homework
Marks
Forum
Schedule
Feedback
Logged in as
jehan

Figure (0.7) : Student panel

1.7.2 Lecturer Panel

The lecturer serves students with all features provided by the lecturer panel after getting authorization from head of the department, as shown in Figure (4.12).

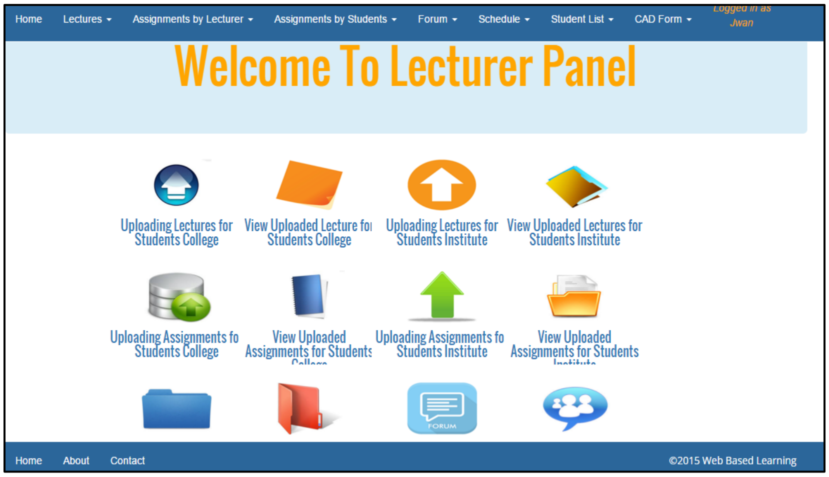
Home
Lectures
Assignments by Lecturer
Assignments by Students
Forum
Schedule
Student List
CAD Form
Logged in as
Jwan
Welcome To Lecturer Panel
Uploading Lectures for Students College
View Uploaded Lecture fo Students College
Uploading Lectures for Students Institute
View Uploaded Lectures for Students Institute
Uploading Assignments fo Students College
View Uploaded Assignments for Students
Uploading Assignments fo Students Institute
View Uploaded Assignments for Students
FORUM
Home
About
Contact
©2015 Web Based Learning

Figure 0-8: Lecturer main panel

- **Head of department module**
- Adding lecturer to course for specified subject.
- Student clearance
- Summer training evaluation
- Uploading schedule
- **Lecturer assessment report Exam committee module**
- Importing students names
- Inserting marks
- Student Ranking
- Changing stage
- ***Institution Quality Assurance Module***
- Lecturer portfolio
- CAD-F Form
- Assessment reports
- ***Institution Admin Module***
- ***University Quality Assurance Admin***
- Add new college or institute
- Add new department
- ***University Curriculum Development Admin***
- ***University Administrator***
- **Statistics**

DPU E-learning system statistics covers:

1-How many students DPU E-learning system have in each year.
2-Number of students in each district.
3-Number of students in institutes and colleges.
4-Number of students in each department and stage.
5-Number of students succeeds in each study year.
6-Number of students failed in each study year.

Conclusion and Future Work suggestions

The important concluded points from the proposed DPU-ELS can be summarized as following:

1. An efficient electronic learning system has been proposed, designed and implemented to Duhok Polytechnic University named DPU-ELS. The proposed system provides the ability of developing learning field system that is depended at all Kurdistan Universities and converting their work flow to electronic approach with remaining principles of face-to-face teaching style. The proposed system will be used to combine all DPU

campuses (including: presidency, four colleges and eight institutes) in one system to be managed electronically.

2. The proposed DPU-ELS improves the style of providing course materials to the student remotely. This is can be done via useful and professional communications between the lecturers in one side and the students in other side. All activities of learning system monitored with full flexibility. Also, DPU-ELS can announce all necessary alarms to the lecturers and students via DPU website, and any request or response will be done via e-mails.
3. The DPU-ELS has been designed with minimum cost and can be copied usefully to any other university inside Kurdistan Region or Iraq.

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